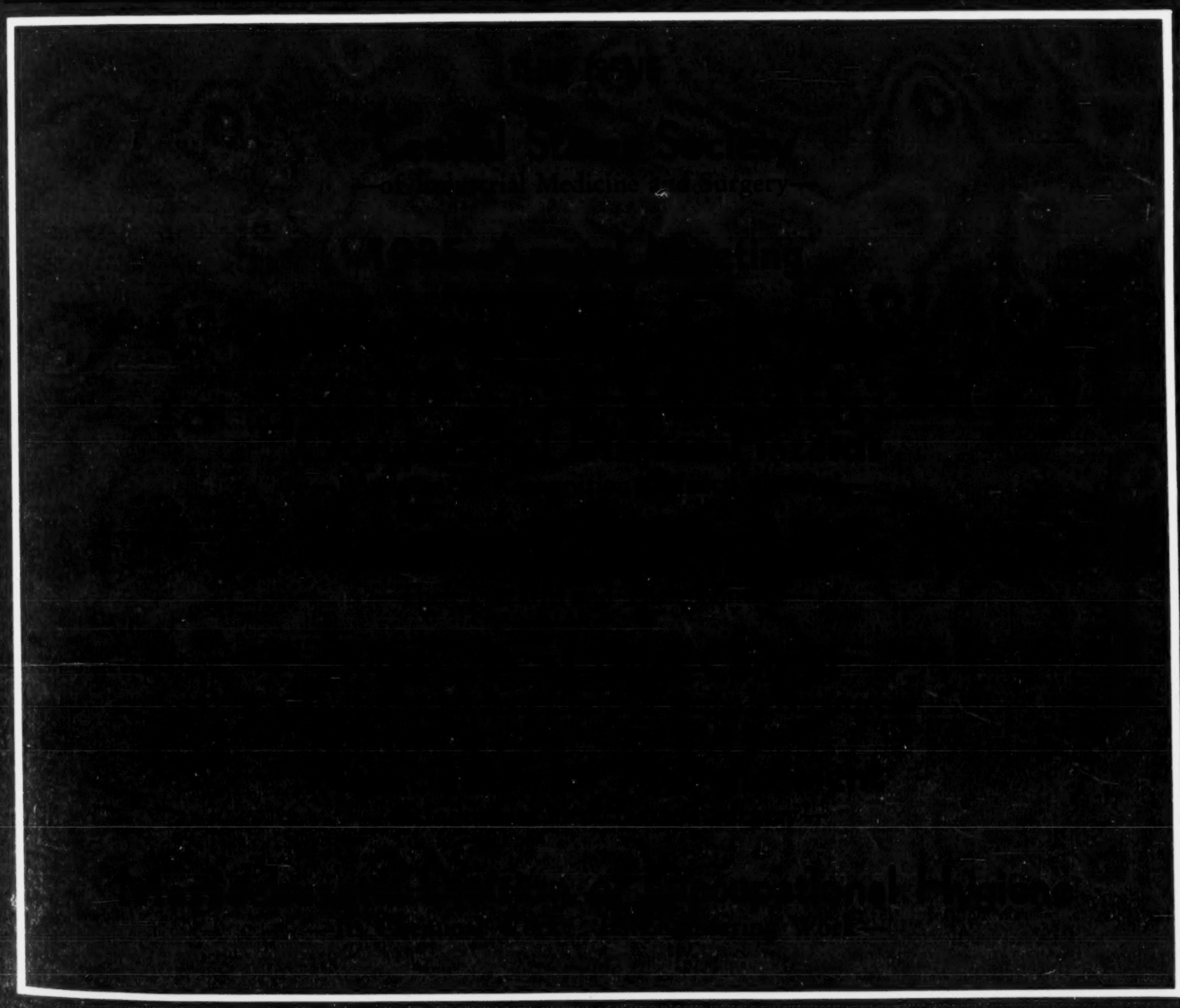
Journal of Traumatic Surgery and Occupational Diseases

Industrial Medicine

for

Physicians and Surgeons in Industry

Volume 4



Sixty-fourth Annual Meeting

American Public Health Association

MILWAUKEE, WISCONSIN

October 7-10, 1935

INDUSTRIAL HYGIENE SECTION

The Program

Will include papers and reports on:

"Respiratory Disease due to Dust among Anthracite Miners",

"Practical Aspects of Occupational Diseases and their Prevention,"

"Industrial Medical Service in the Telephone Industry",

"Industrial Hygiene Instruction",

"A Program for a National Institute of Occupational Diseases".

Scientific committee reports will include Skin Irritants, Pneumonoconiosis, Ventilation and Atmospheric Pollution, Lead Poisoning, and Standard Practices in the Problem of Compensation of Occupational Diseases.

Benzol Poisoning, Lead Poisoning, Pulmonary Asbestosis and Dust Determinations will also be discussed.

The Speakers

The following well-known names appear on the program:

Dr. J. A. Britton, Supervisor of Medical Service, International Harvester Company,

Mr. J. J. Bloomfield, of the United States Public Health Service,

Dr. C. O. Sappington, Consulting Industrial Hygienist,

Dr. Edward S. McSweeny, Medical Director of the New York Telephone Company,

Dr. Emory W. Sink, Assistant Professor of Hygiene and Public Health at the University of Michigan, and

Dr. Henry H. Kessler, Medical Director of the New Jersey Rehabilitation Commission.

The Audience

Industrial physicians, directors of industrial relations, industrial nurses, industrial hygienists and others concerned with medicine and hygiene in industry.

An Invitation

The readers of this magazine are cordially invited to attend the Milwaukee sessions, the week of October 7, and participate in the discussions.

The Chairman and Secretary of the Industrial Hygiene Section will welcome your inquiries.

HENRY H. KESSLER, M.D., Chairman
Medical Director, N. J. Rehabilitation Commission.

BERNARD S. COLEMAN, Executive Secy.
N. Y. Tuberculosis & Health Assn.,
386 Fourth Avenue, New York City.

AMERICAN PUBLIC HEALTH ASSOCIATION

50 West 50th Street, New York, N. Y.

"When 'Omer smote is bloomin' lyre,
He'd 'eard men sing by land an' sea;
An' what he thought 'e might require,
'E went an' took—the same as me!
The market-girls an' fishermen,
The shepherds an' the sailors, too,
They 'eard old songs turn up again,
But kep' it quiet — same as you!
They knew 'e stole; 'e knew they knowed.
They didn't tell, nor make a fuss,
But winked at 'Omer down the road,
An' 'e winked back—the same as us!"

—KIPLING.

Industrial Medicine

Reg. U. S. Pat. Off.

The Journal of Traumatic Surgery and Occupational Diseases

The Law, the Science and the Economics of Industrial Health

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Central States Society

—of Industrial Medicine and Surgery—

NEWS AND VIEWS *of the* 1935 *Annual Meeting, Hotel Faust, Rockford, Ill., May* 21, 1935

A VERY well-attended and successful meeting of the Central States Society of Industrial Medicine and Surgery took place at Rockford, Ill., on May 21, 1935. Reports emanating from the society show that there has been a considerable increase in membership and that the organization is taking a very prominent place concerning medical participation in practice of the industrial type.

The program as given included a fracture symposium during the morning session and a presentation and discussion of various other subjects during the afternoon.

Fracture Symposium

THIS symposium consisted of various papers and demonstrations as follows:

1. "Fractures of the Femur" (with motion pictures) by Dr. R. M. Carter of Green Bay, Wis.;
2. "Miscellaneous Fractures," by Drs. W. R. Cubbins and J. A. Callahan, of Chicago, the presentation being made by Dr. Callahan who showed a large series of x-ray pictures by lantern slides;
3. "Fractures of the Spine," by Dr. C. Scuderi of Chicago;
4. "Fractures of the Hip," by Dr. George L. Apfelbach of Chicago; and
5. "Multiple Fractures of the Pelvis, Complicated by Dislocation," by Dr. C. W. Hopkins of Chicago.

DR. CARTER showed a very interesting motion picture which explained in detail the technique of skeletal traction by use of the Kirschner wire. The picture showed the various types of equipment and instruments used to obtain skeletal traction by this method and also the technique of applying the devices. It was the opinion of the speaker that the principal objection to this method was the possibility of infection. The advantages were chiefly the use of much less weight by this method in securing the proper traction—the procedure being painless to the patient—the control of the peripheral fragments—the securing of a steady, graduated pull — and the obviating of difficulty with soft parts, as well as permitting the exercise of various joints. Data were presented to show that this method permits of shortening of the convalescence period, and that bone atrophy is reduced to a minimum.

DR. CALLAHAN presented a series of approximately 75 slides showing various methods of securing general traction in different types of fractures, and also the use of accessory apparatus adapted to special conditions. The case histories and the indications for specific treatment were described for many different kinds of fractures of the various bones of the human body. One of the important principles discussed by the speaker was that no one method is adaptable to all types of fractures, but one must choose the method best adapted to the case at hand.

DR. SCUDERI presented material chosen from the largest series of fractures of the spine in the world, obtained from the fracture service at the Cook County Hospital. The principle of this treatment was the maintenance of hyperextension of the spine by means of a properly adjusted cast, paying attention to three main anatomical points, the jugular notch, the symphysis pubis and the site of the fracture. Statistics were presented on a total of 94 cases, with mention of results obtained in this series. From experience it has been determined that the location of the spinal fracture may range from the fifth thoracic to the fifth lumbar—ordinarily the higher the fracture the poorer the results, and contrariwise, the lower the site of fracture the better the results. A demonstration of x-ray films was given showing the results in the reduction of spinal fractures.

DR. APFELBACH, in his discussion of "Fractures of the Hip," thought that the question of bone repair is one of great importance and that the surgeon should be guided very much by this principle. A review of the evolutionary development of mechanical methods was given. Differ-

ences of opinion between various specialists, such as Whitman and Cotton, were discussed, showing that both are right in principle but that there is no way of properly exerting traction adaptable to all cases. Consideration was also given to non-operative and operative methods, with preference expressed for non-operative methods, if proper results can be obtained. The reasons for non-union were also detailed and experience given in relation to this difficulty. A demonstration of x-ray films showing various types of hip fractures was made, with discussion of the important points in each case.

DR. HOPKINS, in presenting material concerning "Multiple Fractures of the Pelvis Complicated by Dislocation," was very much impressed by the extent of mutilating injuries from which a patient could finally recover. Illustrative films were shown which brought out this principle, and also which showed the necessity of adapting particular methods of treatment in the different cases.

Afternoon Session

THE afternoon session contained papers on miscellaneous subjects. Dr. C. O. Sappington of Chicago presented a discussion of "Occupational Disease Hazards," (see p. 230). Dr. F. W. Slobe of Chicago, talked on "The Injection Treatment of Hernia," (see p. 226). In the absence of Dr. Adrien Verbrugghen, of Chicago, who was to have presented material on "Injuries of the Brain and Spinal Cord," Dr. Maurice A. Bernstein, of Chicago, presented material concerning the "Operative Treatment of Arthritis," supplemented by a motion picture showing the technique and also lantern slides of various details.

DR. SAPPINGTON believed that the problem of occupational diseases constitutes a very serious socio-economic consideration. One of the chief difficulties has been neglect in the proper association of information regarding the nature and severity of the industrial exposure, with the medical data regarding the effects of such exposure on the human body. There will always be the necessity for differentiating between occupational and non-occupational diseases, and insurance and compensation problems will give rise frequently to this trouble. The control and prevention of occupational disease is an important question, viewed from any angle. After discussing the importance, recognition, effects, and control of occupational disease hazards, the speaker concluded that it is only through constant and consistent gathering of careful scientific information relating to industrial exposure and its effects upon the human body, associated with critical interpretation, that the practical principles of compensation and insurance features of occupational diseases can be acquired and put to sound and thorough economical use.

DR. SLOBE in discussing the injection treatment of hernia, gave a very excellent review of the evolutionary development of this technique and the types of injection material used by various investigators. Figures were presented to show that this method where properly adapted to selected cases, has been very successful. It was particularly emphasized that the method should not be used by persons who are unfamiliar with it—this has resulted, as would be natural, in the exploitation of the method and the development of objections against it by the conservative surgeons. Reference was made to the collection of a great body of statistical data regarding the use of this method, and analysis by various doctors and laymen, who are interested principally in cutting down the amount of time lost from work and hospital expense, which occurs in the operative method. It must be understood that this method is highly selective and is not in any sense a substitute for operative procedure.

DR. BERNSTEIN in discussing the "Operative Treatment of Arthritis," believed that the present use of terms concerning arthritis is somewhat confusing. There are really two forms of arthritis, specific and non-specific. Improvement often comes in arthritis cases because of remissions, and in many instances not because of permanent cure. It has been shown experimentally that the removal of the synovial membrane makes it possible for a new membrane to be regenerated. In some instances this is a distinct advantage. It is quite difficult to diagnose many chronic joints where arthritic changes are not visible in the x-ray film. The speaker believed that there were many cases of arthritis, properly selected, that could be materially benefitted by operative methods. An excellent motion picture was shown, demonstrating the technique of operation on various joints, and also demonstrating the recovery of function in different cases after operation. Lantern slides were also shown giving the surgical anatomy of the knee as an aid to operative procedure.

The Injection Treatment of Hernia

By FREDERICK W. SLOBE, M.D.
Chicago

LARGELY resulting from the assumption of the erect posture by man, hernia was one of the first human ailments to be recognized; even its operative treatment can be traced back to Celsus. One of the earliest investigators using the injection method was Velpeau, who, in 1835, used iodine in the attempt to obliterate the hernial sac. In 1844, Pancoast used a solution of iodine and cantharides. In Germany, Schwalbe, in 1877, used alcohol, and his method, an obviously imperfect one, is unfortunately still used by many European physicians. Quercus alba was employed by Heaton about 1888. Not long after this the paraffin method was introduced. This very inefficient, unscientific method was adopted chiefly by quacks, and is largely responsible for the existing prejudice against the modern injection method. Billroth, in 1880, made the prediction that if tissue proliferation could be produced at the hernial site, the treatment of hernia, in large measure, would be solved. In 1881, Warren emphasized the essential nature of the seroplastic exudation, granulation tissue, and fibrosis resulting from the use of chemicals which did not cause any necrosis or sloughing of tissue. In the last five years some very important reports have emanated from surgeons having a vast experience, and many refine-

ments in technic and improvements in the chemicals used have appeared. Pina Mestre, of Barcelona, has reported a series of 10,000 cases. His solution containing tannic acid and other astringents in an alcoholic extract, has been rather widely used in America. Mayer, of Detroit, reported only 2% recurrence in about 2500 cases, using a solution of zinc sulphate, phenol, glycerin, cinnamon water and fluid extract of pinus canadensis. His solution seems to be quite satisfactory. Wyss, of Switzerland, used the injection method in 2000 cases, of which 91% were successful. He used an inefficient solution, however, which is now little used. Wolfe and Fraser have made important contributions following histologic examination of injected tissues in animals. Travis and Hall have conducted similar experiments. Perhaps the most significant developments of all have arisen from the clinical and experimental work of Bratrud, McKinney, Bell, and Rice in Minnesota. Dr. Bratrud's work in the hernia clinic at the University of Minnesota is outstanding. Much of the technic which I use and the information in this brief article have been obtained from him.

THE existence of a hernia is dependent on the presence of a defect in the abdominal wall which allows the contents to protrude. It is the presence of this defect, not the contents of the sac, that is the important factor. The injection method seeks to reinforce this defect by inducing a seroplastic exudation with a marked subsequent proliferation of connective tissue and endothelial cells. Bell has emphasized the binding effect exhibited by sections showing fibroblasts dipping in between muscle cells. Where the new, relatively non-irritating solutions are used no evidence of necrosis is found by microscopic examination. It seems, indeed, that the old theory of John Hunter—that of "adhesive inflammation"—has been pretty well sustained by recent developments. While the hernia is kept completely reduced by a suitable truss, this fibrous proliferation occurs blocking the internal ring and filling up the inguinal canal. An internal truss is actually built up.

There are several advantages in this method that are noteworthy. The results and recurrence rate compare favorably with the operative treatment. No hospitalization is required. The patient remains ambulatory, losing no time from his work.

As most hernias in compensation cases are not severe, this method should seem particularly attractive to insurance companies and employers. It has been estimated that the saving in industrial hernias alone would amount to $10,000,000 annually if this method were used routinely. It should be a boon, likewise, to the private patient who, during this period of economic stress, often finds it difficult to finance the operative treatment with its hospitalization cost and loss of time from work.

Another field which should have great possibilities lies in the treatment of those individuals who cannot obtain or retain employment because of a potential hernia, weak fascia, or moderate bulging along the canal. A series of injections should reinforce these weak areas, thus preventing the future development of a hernia in a high percentage of instances. This should be a factor of increasingly great economic importance.

There are certain types of hernias, of course, which should not be treated by this method. The method is not applicable to strangulated, incarcerated, or irreducible hernias. Hernias which cannot be held reduced by a truss and those which are not rendered symptom free by a truss even though reduced, are not suitable. Likewise, sliding hernias, postoperative incisional hernias, umbilical hernias, and hernias associated with undescended testicle should not be injected. Hemophilia and hyperthyroidism constitute other contra-indications.

If, following an operation, subsequent examination shows a tendency to recurrence the injection treatment may be very valuable in preventing such recurrence.

MANY of the fears and possible complications mentioned in opposition to this method seem to be based largely on prejudice and lack of personal experience with it. As the fluid is injected just beneath the external oblique fascia there should be no excuse for penetrating the peritoneal cavity. As the hernia is reduced before the injection is instituted, the previous contents of the sac are out of the way and seldom reappear in the sac if the truss is correctly applied. One might conceivably inject fluid into an adherent sac, but this causes an immediate sharp pain; by injecting slowly the needle can be withdrawn immediately. Such a small quantity of solution would doubtless remain in the sac causing an agglutination of its walls. Some of the newer solutions have been injected intraperitoneally in animals without causing any necrosis or abscess although some matting together of omentum and intestine occurred. Direct injection of the vas would seem practically impossible; the spermatic cord has been injected experimentally without causing occlusion of the vas. Epididymitis, atrophy of the testicle, strangulation, sterility, peritonitis, and abscess of the wall have not occurred in the experience of those using the standard solutions. Such instances as have occurred were in the hands of those using obsolete solutions and technic. An occasional transient swelling of the testicle and of the cord has been observed. Tender nodules sometimes develop near the external ring, gradually diminishing in size. Small, transient, hydroceles have been reported but they seem to be rare. Incapacity during treatment is unusual. Most patients lose no time; an occasional patient will lose a day or two. Sometimes moderate soreness will develop along the inguinal canal aggravated by pressure of the truss. It is possible that continued follow-up study will demonstrate certain complications which have not been noticeable up to this time. It is interesting to note, on digital examination, how closely identical are the findings in patients injected and those operated upon.

The technic consists of depositing the solution beneath the external oblique fascia by repeated injections along the entire course of the inguinal canal. For indirect hernia, the first two injections are made at the internal ring, inserting the needle one centimeter above the mid-point of a line joining the anterior superior spine and the pubic spine. Subsequent injections are made along the inguinal canal until finally the external ring is injected, inserting the needle through the

fascia, its point being palpable by the left index finger inserted into the external ring. The area which receives the most injections depends, of course, on whether the hernia is direct or indirect. Hesselbach's triangle can be injected by depositing the solution anterior to the conjoined tendon or transversalis fascia. If Mayer's solution or any other of the stronger solutions is employed, a tuberculin syringe is used, injecting only from 3 to 6 minims depending on the type of case. Treatments are given about twice weekly. The solution which I prefer is Proliferol. It can be used in quantities of 2 to 5 cc and about five injections usually suffice. This is an alcoholic solution the most active ingredient being tannic acid.

The correct fitting and conscientious wearing of a truss is an absolute requirement. The hernia must be kept completely reduced during the series of injections, so the truss should be worn day and night for the first three or four weeks. After that it should be worn for a period of two to six months in order that the fibrous wall gains sufficient strength before being subjected to undue tension. The surgeon should learn to fit his own trusses so that this important phase of the treatment is under his direct supervision. The truss which I have used chiefly is made by the Smithsonian Truss Company, of Topeka, Kansas.

Two prominent causes of failure are, *first*, the use of an insufficient number of injections and, *second*, failure of the patient to conscientiously wear the truss as directed.

It is not my purpose in this brief resume to present any personal statistics, realizing the inadequacy of a limited number of cases extending over a period of only two years. My experience thus far, however, is corroborative of the results reported by others who have had a huge number of cases during a much longer period. During the past two years I have been injecting most of my hernias instead of operating on them, and the results, thus far, have been equally satisfactory.

My purpose in presenting this subject before this group is because I feel it is entitled to much more extensive use. Only when a large number of physicians use a certain method over a sufficient period of time can the true merit of a procedure be ascertained. There is ample statistical, clinical, and experimental evidence to warrant its use.

To summarize, it is my belief that the ambulant, injection treatment of hernia, when judiciously used, is safe, simple, and satisfactory.

Bibliography:

BRATRUD, A. F.: Ambulant Treatment of Hernia, *The Journal-Lancet,* June 15, 1934, p. 337.

IDEM: Ambulant Treatment of Hernia, *The Journal-Lancet,* December 15, 1933, p. 673.

BROMS, ALLAN: The Hernia Injection Controversy, *The Eastern Underwriter,* March 15, 1935.

FOWLER, S. W.: Experience with the Injection Treatment of Hernia, *Medical Record,* February 20, 1935, 141:207.

MAYER, IGNATZ: Hernia Treated by Subcutaneous Injections, *Medical Journal and Record,* January 15, 1930, 131:90.

IDEM: Corrective Treatment of Hernia, *Medical Journal and Record,* March 16, 1932, 135:275.

MESTRE, PINA: *J. A. M. A.—Spanish Edition* (abs.) 1927, 18: 186.

RICE, CARL O.: Injection Treatment of Hernia, *Minnesota Medicine,* May, 1934, p. 248.

RUTLEDGE, FRANK E.: The Lowdown on Hernia, *The Eastern Underwriter,* November 2, 1934, p. 38.

VELPEAU, M.: The Anatomy and Surgical Treatment of Hernia, D. Appleton & Co., 1881, p. 272.

WARREN, JOSEPH, H.: Hernia, Strangulated and Reducible, 1881.

WOLFE, RALPH: Injection Treatment of Hernia, *Medical Journal and Record,* March 4, 1931, 133:242.

WYSS, FRANZ: Die Behandlung der Hernien mit Alkoholinjektionen, *Schweiz. Med. Wchnschr.,* January 26, 1929, 58:85.

Discussion

DR. DON DEAL, Springfield, Ill.: Dr. Slobe stated in his excellent paper that this treatment is not indicated in umbilical herniae. We have treated five of these herniae with very good results. We feel that it is much safer and more reliable and the results are more rapid than in inguinal hernia.

Since recurrence in direct hernia is higher than in indirect, we feel there is a greater indication for this type of treatment in the direct hernia than in the indirect. We have had two cases in which the hernia could not be retained by truss. We kept these men in bed, injected them daily over a period of 10 days. After this the truss did retain the hernia and the patients were permitted out of bed but wore the truss for another month.

I do feel that recurrence after injection is less than after actual experience in surgery.

Recently someone has written an article criticizing this method*. Whoever wrote that article certainly had had no experience in injecting herniae, because the contraindications as he listed them did not apply at all. Our experience has been very satisfactory.

DR. LEROY P. KUHN, Chicago: I am glad that Dr. Slobe distinguished between those of us who have had no experience in this type of treatment and those who have been doing this kind of work.

And I am amazed at the information he has given us in this paper, especially as to the author he quoted who had done some 2000 under this method and had a 90% cure. I think this is something that is going to lead us all into this field in a little more thorough manner than in the past. Having had no experience whatsoever, I have been waiting and watching for the time when I might learn something about it, and perhaps arrive at some of the conclusions Dr. Slobe has given us.

It has been my unfortunate experience during the last six to eight months to be in a position where I have to advise claim departments, and sometimes employers, whether or not this method should be used, and thus far I have hesitated a great deal. I have hesitated to advise the claim departments because I have had no experience myself, and the reports that I have been able to get on this subject are not very extensive.

There is another side to this problem which may be of interest. A short time ago we advised against a fusion operation in a case in North Carolina; the doctors there were divided in their opinion as to whether operation should be done or not. In some way our conclusion got to the wrong side and in a short time we had a malpractice suit against us. The patient has made a recovery without the operation, and I guess the malpractice suit has been more or less forgotten. But you see that the man who does the advising about doing these operations is in a position that is rather delicate.

I have with me today the summary of the claim department of the Massachusetts Bonding & Insurance Company as a claim man looks at this subject. After all, it is largely one of compensation of the injured employee, and I will read a little of the letter. It is sent to me by Mr. Charles M. Alvarez, Manager of the Claim Department. "The injection treatment is untried and presents too many loopholes. It is possible that this may supplant operative methods at some future date. However, until that time comes, we will continue having operative repair for hernia done." He writes almost a whole page on this subject, but that one paragraph covers it pretty well.

The article to which Dr. Deal referred is not signed, but whoever wrote it seemed to me to know something about it. Really it is a problem that we are up against; many of you will be put under the necessity of saying "yes" or "no" on this injection method.

I feel that Dr. Slobe should open a postgraduate school

*J.A.M.A., May 4, 1935, p. 1 58. See p. 275 herein, where this article is reprinted for reference.

and teach us how to use this method. After listening to his excellent paper today I am almost at the place where I am ready to advocate the use of the treatment, although we must not forget the dangers that it carries with it, especially in the hands of those who have not done it before. One of the great troubles about advising the use of this method is that it may be done by those who have not had experience, and complications will occur, various difficulties will arise and some men will get very bad results, and as a consequence the method will be killed for a year or so. You all remember when the maggot treatment of osteomyelitis became popular a year or two ago. That was considered the best way of curing osteomyelitis. Many of us tried it and have now gone back to some of the older methods of treatment. "Surgical repair with a well trained surgeon offers a satisfactory method for the treatment of hernia with a minimum of local tissue injury and little risk or discomfort." We are definitely, of course, against the indiscriminate use of the injection method of treating hernia, and up until the time this paper was read here today I was not much in favor of the discriminate use of the method.

DR. FRANK P. HAMMOND, Chicago: Dr. Slobe asked me before coming to this meeting if I thought you would like the paper on injection treatment of hernia, and I immediately said "yes" because personally I did not know a thing about it, having read only a few articles, which were discouraging. I can see more dangers to the average man if he attempts to learn the method by himself, than to a man who does only an occasional surgical repair. It seems to me that it would be difficult to determine between the thin layers of tissue by the digital touch. Yet I can understand that if a man does a sufficient number of cases he acquires a certain amount of confidence and certainty and that a man who is doing only a few is just groping in the dark. We have done herniae by the operative procedure where the intestine is partially adherent to the sac. I should like to ask Dr. Slobe what he would do in this type of case because, of course, it would occur in the injection type of treatment as readily as in the operative. How does he know that he is not injecting a region of that intestine?

I should also like to ask about the large rings which are suggestive that later in life these men will develop a hernia. I wonder if the injection treatment might not be an ideal situation and we might be more certain of getting the solution into the proper spot in order to tighten up the large ring and prevent an on-coming hernia.

To say that I am amazed is putting it mildly. It is quite typical of the medical profession that when we have become accustomed to a certain procedure we say that it is the way it should always be done. We have heard it said that the only treatment for hernia is surgery, and it is rather difficult for us to recognize or even admit that there is a method which is perhaps better, and that this method is bordering on what we formerly considered a quackery.

DR. A. L. BRYAN, Muscatine, Iowa: I would like to ask about the potential value of this solution given to increase the proliferation in these abdominal walls where the muscles, through infection or long continued drainage after operative procedures, are sloughed away and there is a potential hernia; or the value of this procedure in the senile abdomen where we have done a suprapubic prostatectomy and there is a thinning out above the pubis and a potential hernia so that you feel the patient should wear support. Would it be possible by using this method to get proliferation enough to be of some value?

DR. GEORGE L. APFELBACH, Chicago: In 1927 an article was published covering operations on 13,000 cases of hernia with a mortality of 0.44%. Half of these died of infection and cellulitis and the other half died of embolism. There is a hazard, of course, to hernia operation itself. There is always a question of cure in direct hernia. Dr. Andrews claims that the percentage of recurrence is very high. After you have operated many of these cases you know that the anatomy differs in each individual. I have seen the femoral artery stand up so that you could hardly miss it when you go in, and I have seen the bladder right in front of the canal.

There are certain aspects to this question which make it very interesting. I think we should bring it up again at our February meeting to see what advancements we have made.

As to recurrences, what do we do for them in an operative way? You all know that they are very difficult to handle that way. I can remember one very hot day last summer when an intern handed me three recurent herniae to do. That was a job.

I do not know but what this treatment might be a good one for loose rings. Our company will not hire men with loose rings. I cannot operate these rings, I can only operate herniae. What are we going to do with that class of men?

DR. FREDERICK W. SLOBE, Chicago (closing): I want to thank you all for your very free discussion. I was glad to hear Dr. Deal say he has had good luck in umbilical herniae. I have been very conservative in selecting my patients. I notice that several investigators have mentioned good results in certain umbilical herniae, but most of them feel it is rather dangerous. I do not see why it should not be applicable in selected cases. Success with some large herniae which could not be held symptom free by a truss until they were kept in bed for a while and then were treated by this method successfully is very interesting. I have not attempted this yet.

As we all know, the contents of a hernia are very soft; they do not have any propulsive factors of their own. We get hernia only when there is a defect in the abdominal wall. If we close that defect these soft tissues will have a hard time getting out.

I am glad Dr. Kuhn emphasized the point that care should be taken in this method. Though this method is not entirely new, it may be new to many of us and should not be used indiscriminately by those who do not know how to use it or are not qualified to use it.

I think the report made by Mr. Alvarez is an instance of what naturally occurs. There are differences of opinion among doctors and insurance people about this matter. There are two laymen who have given some very interesting reports* in which they both made a very exhaustive study of this subject. Both were quite enthusiastic about the treatment. In fact, it is from one of these men that I got some of my figures as to the amount to be saved by insurance companies and employers if this method were used. The article mentioned by Dr. Deal, and again by Dr. Kuhn was an answer to a previous injuiry about the injection method. I do not know who wrote this. I believe the man who answered was a very competent surgeon, but I doubt if he has ever tried this treatment or even observed any patient so treated. Of course, experience always is the best teacher, and one should know about this method oneself if one is to be competent to judge it.

I feel that the point made that surgery is successful in hernia is no argument at all for or against this method. Because one method is satisfactory does not mean that another is not satisfactory. For instance, it was not very long ago that we were making big circular incisions around the leg for varicose veins. We do not see that any more, and still that operation was fairly successful. I am not comparing the hernia with the varicose vein operation, because the hernia operation is a standard procedure and will always be standard and will be used in some cases where this should not be thought of, but this method does seem to be an alternative. I do not believe that one can overlook the economic importance of this when you consider the reduction of cost. So far as the surgeon is concerned, it is no cheaper. It takes a good deal more time and care, but it does save hospital bills and six to eight weeks loss of working time.

Dr. Hammond pointed out the fact about an adherent sac. Of course this is possible. I operated one just recently which was exactly like that. It could not be reduced until the adhesions were cut from the sac. Naturally, this type of hernia I would not inject. I do think that in smaller herniae where the omentum is adherent they could be treated this way without danger. I believe that there are times when error could be made and where it would be possible to inject into a loop of bowel. That is the drawback of this method. If this occurred at all frequently, I believe we would have heard of it from these men who have had so many cases.

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*The Eastern Underwriter.

My interest was attracted to this method by Dr. Bratrud, of Minnesota University Medical School. There they injected a large number of herniae. I believe their statistics are conscientious and intelligent, and I felt that this was something to be interested in. Some of the earlier statistics may have been garbled. At the University of Minnesota they use quite a strong solution for injection but they inject it slowly, only 4 to 6 drops at one time. I use this solution also, and have never had an abscess or infection. I did get one aseptic necrosis which I aspirated with a needle. A certain amount of fluid was obtained which showed no organism. That may be one of the probable disadvantages of this strong solution. However, the complications in all the large series of cases reported have been very rare, and it does seem that in these large series most of the complications would have been met sometime. As to serious hemorrhage from a punctured femoral artery, I do not believe that could occur. Some men may have tried this method and had bad results and never repeated it, but I do not feel that there is much excuse for the bad result because I do not go very deep in injecting. You can tell when you go through the external oblique. In a certain sense you can feel that give way. You deposit the solution just beneath the fascia. You do not try to get beneath the peritoneum. You can gauge this by the amount of fat on the individual.

Now as to potential herniae and loose rings. I consider the loose rings a very great field for this method. Nowadays employers will have their men examined befor and during employment, and they are doing this more than ever before. Those unfortunate individuals who have loose rings cannot obtain or retain a position because of this defect. Many of those patients develop hernia after having been put to heavy work. This type of patient I believe offers a great field for this type of treatment. I feel that you can prevent, in a large degree, hernia development in this type of individual.

The value of this technic in thin abdominal walls following severe infection or in old post-operative cases I cannot discuss. I doubt whether it would be applicable there. It might stimulate proliferative tissue, but whether it would be sufficiently strong to hold I question, but I do not believe it would do any harm.

Dr. Apfelbach's remarks about surgical statistics are very true, of course. The standard clinic shows very low mortality, but the surgical hazard is always there. There are many patients who are always very fearful of operation.

So far as I know, the rate of recurrence following this type of treatment is about the same as the rate of recurrence following operative procedures. I have not had any recurrences yet, probably because I have not observed my patients long enough or have not had enough. I had one recurrence on an early case; this patient was re-injected and has not had any further trouble. I do not see why you could not treat these patients again by re-injecting and re-applying the truss.

I do not want everyone to rush into this, but I have been very much surprised at the freedom from complications which I have had thus far. It should be used in certain cases and by any individual who knows how and when to use it. I believe the safest way would be to restrict its use to the smaller simple herniae in which there is very little doubt about their being reduced and held in place, and I think most dangers could be largely eliminated.

Occupational Disease Hazards
Importance—Recognition—Effects—Control

By C. O. SAPPINGTON, M. D., DR. P. H.,
Consulting Industrial Hygienist,
Chicago

LEGISLATIVE, commission, and court decisions and their economic sequelae have greatly emphasized the importance of occupational disease problems within recent years. These problems have always been in existence, but they have not been brought so abruptly to the notice of manufacturers, insurance companies, physicians and attorneys, until the economic implications and actualities have been recently realized.

It is apparent that there has been a considerable lack of appreciation on the part of industrial physicians and surgeons of the occupational hazards which may produce an occupational disease, considered from the point of view of etiological factors; clearly, it is just as much the duty of a physician to ferret out and study the etiological relationships in occupational diseases, as it is in diseases of non-occupational origin. Medical men have repeatedly and consistently delegated this work to such persons as would take it—or non-medical persons have assumed that this field belonged to them—with the result that even where occupational hazards have been the subject of proper investigation, there has been no definite attempt at correlating the engineering information with the medical data, and building up a whole mosiac of the entire picture.

Perhaps it is a good idea here to give a simple definition of two descriptive terms or expressions, namely, "occupational disease" and "a poison." An occupational disease is one which arises out of and in course of employment and is peculiar and incident to the occupation in which it occurs, but is exclusive of certain accidental injuries. A poison may be simply defined as a substance which when taken into the body in sufficient concentrations and over certain periods of time causes continued irritation resulting in a definite impairment of normal function. Even when such simple definitions are used, difficulties may arise, which will be indicated later in this paper.

In considering hazards in industry which may cause diseases of occupation, it is not sufficient to know merely that potentially injurious substances are used in the manufacture of industrial products; we must know the amount and quality of the compounds involved in the exposure, and also the processes, or the way in which these substances are manipulated. It must also be borne in mind that occupational disease occurs in other ways than exposure to dangerous or potentially deleterious substances—for example, caisson disease as you well know is dependent upon changing conditions of atmospheric pressure.

Before considering how occupational disease hazards may be recognized, it is highly desirable to know the indications for an investigation of the occurrence of conditions which may be considered hazardous. Interesting in this regard is the recently released study made by the U. S. Public Health Service in a typical industrial area in the United States, this investigation having brought out that inorganic dusts, carbon monoxide, and lead compounds, are still the most important materials of hygienic viewpoint confronting the industrial hygienist. Others of importance, but less frequently encountered are chronic acid vapor, hydrogen sulphide, carbon disulphide, carbon tetrachloride, trichlorethylene, benzol, dichlorodifluoromethane, dichlorotetrafluoroethane, ethyl chloride, methyl bromide, methyl chloride, methyl formate, methylene chloride, monofluorotrichloromethane, propane, sulphur dioxide, chlorine, phosgene, arsenic, manganese, mercury, phosphorus, nickel carbonyl, cadmium, radium, hydrochloric acid, hydrofluoric acid, nitric acid, sulphuric acid, methanol,

and similar compounds. This list is not by any means exhaustive, but merely shows the possibility of abnormal conditions resulting from exposure to these substances under certain circumstances.

Recognition

IN discussing the recognition of occupational disease hazards, it is well to repeat that the mere existence of potentially deleterious substances is not evidence of a hazard—it is necessary to know the amount and quality of potentially hazardous substances used, and associate them with the processes and the environmental surroundings, and compare data thus obtained with established criteria, thereby securing the scientific measurement of the hazard, if any exists.

The methods which are used in the recognition of occupational disease hazards are as follows: a physical survey of plant conditions associated with an occupational analysis and history of employees involved; through this information, an adequate plant investigation including collecting and measuring of atmospheric samples and gross samples, together with physical and chemical determinations; an assessment of the efficiency of protective apparatus and devices is also obtained through quantitative estimations of the amounts of potentially injurious substances found in the working environment; the final step is the assembling of the information and comparison with standards which have been previously established for healthful working conditions, and in addition, interpretation of the significance of the data.

Medical information can be obtained through pre-employment examinations with especial emphasis upon the type of occupational disease to be experienced and the relationship of this to abnormal conditions or defects in the human body which may be aggravated or by which actual disease may be produced under such exposures as previously found; use of periodic examinations of employees in departments and operations where known hazards are in existence, the frequency varying under different circumstances, but the principle of subsequent proper placement and supervision according to the results of the examinations and the hazards encountered, being of paramount importance; laboratory examinations, such as x-rays of the various parts of the body, blood determinations, urinalyses, and others, to determine further the effects of exposure on the body and to be used as supplementary evidence (positive or negative) to the physical findings; in addition to these two types of physical examinations, for the purpose of making records complete, a so-called "exit" examination has been proposed; finally, the prompt transference of any employee showing signs of occupational disease to a non-hazardous occupation.

Several difficulties have presented themselves in our previous experience with the above procedures: in the first place, there has been considerable neglect in the proper association of the engineering information regarding the nature and severity of exposure with the medical data regarding the effects of such exposure on the human body. Probably this happens because those who are qualified to measure and assess industrial exposure have not themselves appreciated the medical angles and, contrariwise, the physician who has been concerned mainly with the clinical investigations, has not really understood the importance of adapting his examinations and laboratory work to the type of exposure to be experienced, or of interpreting his findings as the direct results of occupational environment. It can be realized, however, that if we are to make real progress in gathering valuable information on the subject of occupational diseases, the etiological factors in the industrial environment must be very closely associated with the clinical effects.

Another impediment to the progress of scientific work in the field of occupational diseases has been the necessity for distinguishing between occupational disability and non-occupational abnormalties. Referring to our original definition of the term "occupational disease," we may for purpose of discussion divide all diseases into three classes: those which are ordinarily thought to be non-occupational in character; those which may be either non-occupational or occupational; and those which for all practical purposes are occupational. Cancer is a well-known disease and in most instances it is believed that it is non-occupational in type—yet there have been well-authenticated cases of cancer having an industrial factor in the background. Carbon monoxide poisoning may be either occupational in cause or non-occupational (we can point to the many instances of carbon monoxide poisoning from breathing exhaust gases from private automobiles as a non-occupational type, and we can also say with soundness that carbon monoxide poisoning has occurred among industrial employees). Lead poisoning is recognized as a typical occupational instance of poisoning—yet a large series of cases of lead poisoning have been reported in children who have not had industrial exposure, and lead poisoning has arisen from drinking water conducted through lead pipes, and also from the use of home-distilled spirits.

We thus observe that there is considerable overlapping of non-occupational and occupational diseases, and diseases which may be either occupational or non-occupational in cause. This calls for considerable judgment, discrimination and experience on the part of those who are especially qualified, as well as a critical and searching examination of working conditions with a careful assessment of the real hazards.

Effects

IN discussing the effects of occupational diseases, it is again essential to appreciate that all potentially injurious conditions or substances do not produce actual disease—temporary disturbances of physiological function may occur without disease production. Actual disease does happen for several reasons: the selection of poor employment risks; the breaking down of Nature's defenses; predisposing factors in different individuals; the exceeding of the threshold or toxic limits of injurious substances; a change of processes and materials in industry; and the lack or inefficiency of environmental protection.

When disease does occur, three distinct groups are primarily affected: employees, employers, and insurance carriers. The employee not only suffers disability but may also cease to be a pro-

ducing unit, thus becoming a burden upon society; employers experience various types of losses such as increased labor turnover, increased spoilage of products, increased absenteeism from work, idle machines, and decreased production; insurance carriers are obliged to meet the financial difficulties in carrying insurance on occupational disease problems—the amount of money used for this purpose has increased all out of proportion during the past several years when compared with previous experience.

The cost of occupational disease is a subject about which we know comparatively little, because of the inefficiency in reporting. However, representative industries within the past several years have been confronted with damage suits aggregating in some plants as much as two and a half million dollars; the total amount of damage suits pending has been estimated to be in the neighborhood of five hundred million dollars; added to this is the cost of hearing and compensation in states which have such provisions, which totals about $10,000 in each instance.

As a result of all these factors, present and future legislative trends show that a common principle permeates practically all legislative activity—that it is more satisfactory to all concerned to have occupational diseases under a properly written and administered act. Realizing the inadequacy of existing laws, or in many instances the existence of no laws, a considerable number of states now have or will continue to have for some time, pending legislation referable to the compensation of occupational diseases.

Control

THE control of industrial hazards and the elimination of them so far as possible, associated with the prevention of occupational diseases is of utmost consequence. Probably the progressiveness of any industry will be largely determined by the ability and foresight used in the control of hazards and the prevention of disease, applying all possible means and methods. Further, it is sound to believe that time, money, and effort wisely expended now can reasonably be expected to pay large dividends in the future.

The methods available for the control of hazards and the prevention of disease are the engineering and medical supervisory measures which have been previously mentioned in regard to the discussion of the recognition of occupational disease hazards and disease. One point is of particular importance: It seems that the usual procedure has been to "put the cart before the horse," since many medical men have been content to wait until exposure to environmental hazards has produced disease effects upon the human body, the diagnosis of such effects resulting in the inevitable conclusion that the diseased persons must have been exposed previously. It seems rational that the problem should be attacked at its source, namely, where the exposure took place, and definite scientific effort be made to disclose the hazard, measure it, and control or eliminate it after its characteristics have been studied. Insurance companies have come to realize that this is the crucial point in evaluating a possible occupational disease risk for purposes of underwriting, and great emphasis will be placed on the economic importance of this principle.

Study and maintenance of men, machines, and materials, as well as methods, will become the order of the day. It therefore behooves industrial physicians and surgeons to properly prepare themselves and to gain the necessary amount of experience, in the adequate coordination and interpretation of exposure and medical data—first, recognizing the hazard if one exists, next, assessing the severity of the hazard, and finally, interpreting the physical examination and clinical laboratory findings, in the light of previous or contemplated industrial exposure, both before and after disease occurs.

Summary

THE socio-economic problem of occupational diseases makes it mandatory that occupational disease hazards first be recognized, next measured scientifically, and finally, that this information be definitely correlated with clinical data. Industrial physicians and surgeons should, therefore, avail themselves of opportunities to build up all possible coordinating influences which will bring about the amassing of records containing well-warranted conclusions based on exposure data and clinical findings. Such records will be invaluable in the future in determining what procedures are necessary in the control or elimination of occupational disease hazards and the prevention of disease.

The proper association of engineering and medical information is also necessary for correct diagnosis, and even the indications for treatment. In this respect, industrial physicians and surgeons must create for themselves a better scientific appreciation of the etiological relationships of occupational diseases.

Finally, it is only through constant and consistent gathering of careful scientific information of this type, and with it critical interpretations of the problems involved, that the practical principles of the compensation and insurance features of occupational diseases can be acquired, and put to sound and thorough economical use.

Discussion

DR. WILLIAM R. CUBBINS, Chicago: Has not silicosis been thrown out by the Supreme Court?

DR. GEORGE L. APFELBACH, Chicago: Yes. It has but it can still be brought up before the Industrial Board.

DR. C. O. SAPPINGTON: There are a lot of technical aspects about silicosis which I do not believe have been settled yet. What has been determined is that Section 1 of the Illinois Occupational Diseases Act has been determined unconstitutional. That does not deprive any workman of his right of suing. It is usually decided that contributory negligence is the cause of the trouble in the first place, and that is still constitutional. The whole question is far from settled.

DR. FRANK P. HAMMOND, Chicago: I should like to ask Dr. Sappington about the rash that occurs on the hands and wrists of tire builders from the powder they use. Is that really the cause of the rash?

DR. SAPPINGTON: That is what the men who do that kind of work call an accelerator. A great many of these accelerators are irritants to the skin, and this is classed under the heading of hexyl rash. This is one of the cheapest forms of organic accelerators used in making rubber. These substances have been studied and worked out so that it is known which are ordinarily irritant to the skin and which are not. They can be pretty well classified that way. Of course, we all know that it

is very difficult to say definitely whether any one substance will be irritant to any given person, because you have to take into consideration the susceptibility of that person.

Fractures of the Femur

By RALPH M. CARTER, M.D.,
Green Bay, Wisconsin

THE principle of skeletal traction in the treatment of fractures is not new, but the methods of applying it have undergone many changes. Time will not permit a review of the historical field, although this contains much of interest. Suffice it to say that skeletal traction was first put upon a practical basis when Steinmann proposed the method which is now known by his name, and which he first demonstrated in June, 1907, before the medical society of Bern. Although he was by no means the first to use the perforating nail for purposes of traction and extension, he so simplified the procedure as to render it widely applicable and generally successful when properly carried out in those cases in which it is indicated.

It is of interest to note that his method when originally proposed met with a storm of opposition and criticism, which has not entirely subsided at the present day. This opposition, then as now, arose from those unfamiliar with the method and its possibilities, and the objections were based chiefly upon the danger of infection.

In all cases in which continued weight extension is necessary, properly applied skeletal traction offers many advantages over the methods commonly employed.

By means of it, powerful traction can be obtained immediately upon the structures which it is desired to influence. Therefore, since none of the effect is taken up and wasted upon the skin and intermediate soft parts, as is the case when adhesive plaster is employed, results may be obtained by the use of much less weight. On the other hand, if reduction proves difficult and displacement hard to overcome, as much weight as is requisite may readily be applied, with no discomfort to the patient, and with no danger of damage to the soft parts. Practically any degree of shortening may thus be combated.

To satisfactorily overcome the resistance to spasmodically contracted muscles, only a steady, correctly graduated pull is really effective. With proper attention to see that the weight hangs free, skeletal traction is regular and continuous. Once applied, it remain in place as long as needed.

Contrary to what might be expected, properly applied skeletal traction is absolutely painless. The patient is comfortable from the hour of its application. In fractures of the femur, in which treatment is necessarily of long duration, this is of inestimable value, and if the method had no other advantages over other methods to recommend it, this one alone would decidedly incline the scale in its favor.

In the treatment of fractures, one of the basic principles essential to success is that one fragment must be capable of being controlled. Skeletal traction assures practically complete control of the peripheral fragment, thus permitting it to be brought into correct alignment with the proximal one. Not only axial and lateral displacements, but also rotatory ones are thus easily corrected. In addition to its direct action on the peripheral fragment, because of the fact that its effect is exerted directly on the bony structures, none of it being taken up by the soft parts, skeletal traction also exerts a slight but definite influence on the proximal fragment, which is not the case with other forms of traction.

For the application of skeletal traction, only two circumscribed points are necessary, the rest of the limb being left entirely free. This constitutes one of the great advantages of the method. All the difficulties and dangers of adhesive plaster traction are thus avoided. Conspicuously absent are the usual irritation and blistering of the skin, the eczema, the disturbances of circulation. decubitus ulcers, localized gangrene, etc. It can be used in extensive wounds of the soft parts, in compound as well as in simple fractures, in conditions in which the use of adhesive plaster would be impossible.

Because of the fact that the limb is left free, care and attention may be given to the muscles and neighboring joints; stiffness is thus avoided. and after union of the fracture has taken place, the usual period of functional convalescence is much shortened.

Since every question has two sides, objections have naturally been advanced against skeletal traction. Some of these are valid as regards some particular form of application of the traction. others rest upon an apparently sound theoretical basis which practically does not exist, and still others arise from insufficient knowledge and experience with the procedure.

The chief objection which can be urged against the employment of skeletal traction is that there exists a possible danger of infection. Certainly with improper and careless technic infection can occur; this is likewise true of any surgical procedure; on the other hand, with the rigidly aseptic technic which should always be employed, just as certainly infection can be avoided. This is especially true when a fine piano wire, such as that recommended by Kirschner, is used.

It has been argued that important structures such as nerves or blood vessels may be injured by the passage of a perforating pin or wire. Such a danger is non-existent if the operator makes use of the anatomical knowledge which he should possess, and selects the proper spot in which to make the insertion.

It has also been asserted that consolidation of a fracture is much slower when skeletal traction is employed. If too much weight is used, giving rise to a diastasis of the ends of the fragments, this is undoubtedly true. However, the fact simply emphasizes the necessity for frequent checking by means of the x-ray until the exact amount of weight necessary to bring the fragment ends into close apposition is found. Under these conditions, union will occur, with normal rapidity.

Theoretically and practically, substitution of the perforating nail by a fine steel wire represents a distinct advance over the older method. What has already been said in regard to the advantages and disadvantages of skeletal traction in general applies equally to traction by means of a perforating wire. But the latter method possesses additional advantages. Since the wire is itself drill pointed, it is much simpler to put through the

bone than the steel pin, which must be driven in by means of a hammer or mallet. On account of the fineness of the wire, it occasions very little change in the bone structure, and on this account may be left in place for much longer periods than the pin; and finally, again on account of the small size of the wire, any possible danger of infection is reduced to a minimum.

Various ways have been suggested for putting the wire through the bone and for applying traction; the apparatus of Kirschner is one of the simplest, and is the one which I use. In addition is needed a modification of the Braun splint, such as Bohler's, or one of several similar types which are available.

With this equipment practically any fracture either open or closed, of the long bones of the lower extremities can be satisfactorily treated, and an excellent functional result secured without any operation more formidable than that required for the insertion of the wire. It should be clearly understood that I am excluding from this discussion fractures of the femoral neck; these constitute a separate class, and while skeletal traction may sometimes be employed with advantage in certain cases, it is by no means indicated in the great majority of such fractures; consequently they do not here enter into consideration. But to all other fractures of the shafts of the long bones which require traction, this method is applicable.

From my experience with this, and other methods of treatment, I am convinced that the length of time which is required for functional restoration is definitely less when the Kirschner method is employed. This decrease in length of disability is to be attributed entirely to the excellent condition in which the neighboring joints and muscles may be maintained during the period of consolidation of the fracture, in cases of fracture of the femur by active exercise, and in cases of fracture below the knee by the use of the ambulatory cast. That a condition approximating normal is present is proved conclusively to my mind by means of the x-ray. Films show that the bone atrophy which is almost invariably present in cases which have been submitted to prolonged immobilization is conspicuous by its absence where "functional" treatment has been carried out.

As I have stated, for success with this method, close attention to essential details is important. This necessitates frequent thorough inspection, particularly in the beginning of the treatment. I am here referring especially to fractures of the femur. After a few days, with a little explanation, the average patient has grasped the underlying principles, and readily cooperates by himself seeing to it that the traction is at all times active, that the splint remains in the proper position, etc. A single daily inspection is then all that is required.

In conclusion, it must be emphasized that this is not a method to be employed by the man who treats relatively few fractures; hospital facilities and surgical experience are indispensable prerequisites. Nor is it a method which will appeal to the man who looks upon a fracture case as a rather disagreeable interruption to an otherwise well organized and fairly comfortable routine, and as such, something to be got through with with as little trouble as possible. But to those surgeons, particularly industrial surgeons who are doing considerable fracture work, and who are conscientiously interested in improving the treatment of fractures in general and in securing better end results, I most highly recommend this method.

Discussion

DR. WILLIAM R. CUBBINS, Chicago: I have used skeletal traction during treatment of fractures and I think it is not right to say you cannot pull fractures down with adhesive tape as well as with skeletal traction. It takes much more weight to accomplish traction with adhesive tape above and below the point of fracture, but it can be done.

I also want to say that these wires will cut and we know it. A Steinmann nail will cut, too. However, the Steinmann pin will not cut through the lower end of the femur. We have found that treatment of fractures along the lines described by the essayist is very questionable and very uncertain.

Dr. Callahan and I feel that union of a fracture depends on a number of things: the degree of force that the individual has sustained, the length of time during which that force continues to act, and the very careful handling of the fracture. Let us say that there has been an accident and a man's leg is broken; the car is turned over and then the patient is thrown out. This happens, you know, quite often. During all that period of time that injured leg has been waving around without support. In about 20% of such cases we can say that we get non-union.

Of course, in our cases we do get some stiff knees; they are not as freely movable as we would like to have them, but we feel that by the simple application of adhesive plaster we get very good results. And here I would like to say that not a single piece of circular adhesive is put on in our wards. We do this and insist upon it because in different individuals the skin slips at different periods. In some patients you can place the adhesive on without chafing the skin, but the skin will slip off one patient out of 10. You may have 15 to 20 patients without adhesive slipping, but the average will be one in 10, and we have observed this repeatedly.

When you talk about pulling all fractures in place, that is a nice term. It simply cannot be done. I do not care whether you use skeletal traction or what you use.

We have a man with a dislocation of the proximal phalanx, and Dr. Callahan put on a Japanese ring and he pulled and the resident pulled and the wardman pulled and not one of them could budge that fracture. Dr. Callahan opened that fracture and there was a band of tissue; the phalanx had been thrown out of the capsule and could not be reduced. That one ligament was cut and the bone slipped into place, requiring no reduction. That happens in fractures of the phalanx and will happen in both bone fractures of the leg. Skeletal traction will pull some of them in place, and there are some that nothing will pull into position. There is no one way of doing things.

We must remember that many men have to do things very simply. We could not have enough Kirschner wires to go around through our wards, but in some cases we have used them with remarkable success.

The essayist says that his fracture cases are incapacitated for six to eight to 10 weeks. Ours do not do that well. We have a few that will unite in a short time, but sometimes ours take from 110 to 120 days. The average length of disability as given in textbooks is entirely too short.

In pulling down fractures of the femur, extreme care must be taken to prevent subsequent bowing outward. The number of days it will take to get a good result will astound you. This whole problem is far from simple, and apparently the result will be better the longer the period of time taken.

I had a long argument with Roger Anderson about the use of wires. That can be done, I grant you, in a certain number of cases, but when he says that that can be done with a system and a certainty all the time, I am from Missouri.

I want to congratulate Dr. Carter on his paper. I think it was very well done and beautifully presented and aside from the few criticisms I have made, I want him to

know that I consider it a very estimable piece of work.

DR. RALPH M. CARTER, (closing): I want to thank Dr. Cubbins for his discussion. I did not mean to imply that you cannot do with adhesive what you can do with Kirschner wires. My experience is not nearly so extensive as Dr. Cubbins', of course, but I find that my patients are more comfortable with wires than with adhesive.

I have never seen a wire cut; I have had them break. I have seen some experimental work on the subject, and I thought that it proved that cutting would not take place.

I did not mean to go into the question of non-union in my short talk. I meant to say that too much weight would undoubtedly lead to slowing up of union. As to the original trauma, that does not enter into the discussion. I agree that not every case can be treated this way, especially not those fractures of the lower leg which cannot be brought down, and in these fractures there is some band of fascia preventing reduction by the closed method. I also agree as to the textbook statements regarding the length of incapacity. I get the patient up in an ambulatory splint as soon as he has a firm enough callus. If he gets up too soon you will get a bowing afterwards.

I feel that a man who treats fractures should be able to apply any one of a number of different methods. I should not expect to treat every fracture with the same method.

Association for Advancement

—of Industrial Medicine and Surgery—

ASSOCIATION FOR ADVANCEMENT OF INDUSTRIAL MEDICINE AND SURGERY is the name of the new organization of industrial physicians and surgeons just formed by more than 100 Medical Directors of New York corporations.

All of these men have been actively engaged in the practice of industrial medicine and surgery for many years; each of them occupies a position of particular responsibility with the various insurance companies writing workmen's compensation, or with large self-assured industrial companies.

The purpose of the Association is primarily scientific, in that its endeavor will be to disseminate accurate medical knowledge in connection with the diagnosis and treatment of all conditions arising out of and in the course of an employee's employment.

It is in that way that the Association can, *first*, benefit the injured or disabled employee, and, *second*, reduce the cost to the employer of his necessary compensation and occupational disease insurance, by rehabilitating the individual employee in the manner most satisfactory to all parties concerned, and in the least amount of time.

The Association also intends to prove to every one interested—and that includes *all* employers, *all* employees, and *all* physicians—that the best results are obtained by those medical men who have specialized intensively in the particular field of industrial medicine and surgery; the Association will aim, therefore, to be of utmost help and assistance to the general medical practitioner, instead of critical of him.

Thus the industrial employee will be given effective medical treatment, and the industrial employer will be protected against excessive financial burdens resulting from questionable claims and exorbitant charges.

THE first meeting of the new group was held on April 11, 1935. The announced purposes were heartily endorsed. The Board of Directors was chosen as follows:

DR. WILLIS W. LASHER, Employers Liability Insurance Co.;

DR. J. J. WITTMER, Consolidated Gas and Edison Electric Cos.;

DR. ANTHONY AVATA, Hartford Ins. Co.;

DR. DAVID SHAPIRO, Lumber Mutual Casualty Insurance Co.;

DR. H. HALSTED, Globe Insurance Co.;

DR. B. C. HAMILTON, Aetna Life Ins. Co.;

DR. A. R. TILTON, Travelers Ins. Co.;

DR. LYLE ELLIS, Travelers Ins. Co.;

DR. J. R. BLAUVELT;

DR. GEORGE A. KOENIG, National Biscuit Co.;

DR. FREDERICK L. MOSSER, Third Ave. Ry. & Bus Lines;

DR. A. J. LANZA, Metropolitan Life Ins. Co.

These men, with DR. HENRY GREEN of the Interboro Rapid Transit Lines, DR. H. SPAULDING, DR. IRVING GRAY, DR. T. WALLACE DAVIS of the Maryland Casualty and Borden Companies, and others, were prime movers in getting the Association organized.

DR. WILLIS W. LASHER, Assistant Professor of Traumatic Surgery at the Postgraduate School of Columbia University, member of the American College of Surgeons, and Medical Director of the Employers Liability Insurance Company, is PRESIDENT.

DR. J. J. WITTMER, Medical Director, Consolidated Gas Company and Edison Electric Company, is VICE-PRESIDENT.

DR. ANTHONY AVATA, Medical Director, Hartford Insurance Company, is TREASURER.

DR. DAVID SHAPIRO, Medical Director, Lumber Mutual Casualty Insurance Company, is RECORDING SECRETARY.

The only non-medical member is the EXECUTIVE SECRETARY, J. J. BLACKFORD, who is associated with Robert Coleman, Inc.

THE membership not only comprises those who have specialized in industrial medicine and surgery, but also includes a number of eminent specialists who are consultants.

Each applicant, to qualify for membership, must sign the following pledge:

"I further agree that I will conduct myself in my practice in accordance with the Code of Ethics of the Medical Profession; and that I will not participate in the diversion, transference, assignment, rebating, or refunding of a fee for medical care, or solicit or employ another to solicit for me, professional treatment of injured employees."

It is reported that the new Association has more than 500 applications for membership at the present time, and expects to have twice that number by mid-summer.

OCCUPATIONAL diseases, with talks and discussions on certain of their scientific phases, were the subject matter of the first meeting, on April 11.

Dr. A. J. Lanza, Metropolitan Life Insurance Company, was the first speaker. He was followed by Dr. George Orenstein, Dr. Irving Gray, and Dr. Joseph J. Eller; and Dr. Charles T. Graham-Rogers presented the closing discourse.

The second meeting, May 15, was devoted entirely to consideration of the recent medical practice bills passed by the session of the New York

Legislature lately adjourned. The meeting was addressed by Dr. Louis I. Harris, Former Health Commissioner of the State of New York, and several others.

Discoveries in Absenteeism

WILLIAM WRIGLEY JR. Company's Chicago plant, during the last three years, has been making some studies of absenteeism on account of sickness. Of its employees, 80% are women. Analysis of the physical characteristics of the more habitual absentees showed that they were nearly all overweight or underweight with reference to height. Having in mind a reasonable individual normal weight, two diets and sets of exercises were prepared; every woman employee was required to have her weight taken periodically, and those who were overweight were given one diet and set of exercises, while those who were underweight were given the other. In talks with these employees it was pointed out that continued good health demands a normal weight, and it was urged—without, however, any compulsion expressed or implied—that the good results to be obtained from striving for a "normal" would depend wholly on the individual desire and willingness to cooperate.

What followed was almost a surprise. For years the office had maintained a file of extras who could be called in to keep the working force at its necessary figure. This file began to be used less and less. In three months the decrease in the use of the file was very marked. And in six months the absenteeism from sickness had been reduced about 25%, while at the end of the year the reduction was 35%.

When the Wrigley factory was getting ready to be opened to Century of Progress visitors, the women employees were dressed in regulation white uniforms. There was still something lacking, however, in the ultimate neatness, and a little study called attention to shoes and stockings. The employees there were following the time-honored custom of employees everywhere in wearing old shoes and about-to-be-discarded stockings while at work. And so white stockings and shoes were made regulation dress, the employees changing in the locker rooms.

Here again there was a surprising result, by way of another 30% reduction in absenteeism from sickness.

The weight studies were made with absenteeism in mind: the appearance studies with appearances in mind.

Each study accomplished its purpose.

But the combined effect of both studies has accomplished still more: there has been a pronounced improvement in the quality of the individual employee's work in production, amounting to about the same percentage of increase as that by which the total of absenteeism on account of sickness was decreased.

To encourage adherence to the weight suggestions and to maintain the continued neatness of appearance, which have had such marked effects, Dr. L. Grace Powell Sitzer, who is in charge of the factory personnel, has developed a system of merits and demerits among the employees and competitions in respect of the merit marks among the departments. Before Dr. Sitzer began the studies, staying away from work was considered rather usual.

Now being absent is so unusual that it is only done in cases of critical illness; attendance at work and neatness of appearance have become a matter of individual employee pride.

Tannic Acid Silver Nitrate

Treatment of Burns

BETTMANN submits an improvement on the tannic acid method of treating burns.* This consists in the use of a 5% solution of tannic acid followed by a 10% solution of silver nitrate. He states that far better results are obtained and lists the following advantages:

1. The saving of lives that would be lost through the slower method;
2. The immediate stopping of the loss of body fluids, thereby preventing the consequent concentration of the blood;
3. The immediate prevention or very definite minimizing of shock;
4. The immediate prevention of the absorption of toxic products;
5. The prevention of infection by the short period of application of moisture and the early drying of the tanned tissues;
6. The saving of the kidneys and other organs from the effects of fluid concentration and the absorption of toxins and infection;
7. The greater comfort of the patient;
8. Safe carrying of the patient past the first 24 hours, which is the most critical period following a serious burn;
9. Avoidance of the second critical period, that of infection and late absorption of toxic products;
10. The simplification of the nursing problem, especially in the first 24 hours;
11. The prevention of further breaking down of tissues, from long application of wet dressings;
12. Prevention of chilling, which also results from the long application of cold, wet dressings;
13. The formation of a thin, flexible coagulum;
14. The speedy healing of the burned areas with a shortened period of hospitalization;
15. The prevention or minimizing of heavy contracting scars by early rapid healing in the absence of infection; and
16. The lessening of the amount of skin grafting and secondary corrective surgery necessary.

The author has treated 21 cases with gratifying results except in the case of a man of 77 who had an 80% burn and who died 10 hours later.

Compensation Comparison

NEW YORK has three and one-fourth times as many employers covered by Workmen's Compensation insurance, two and one-half times as many premium receipts and one and one-half times as many claims filed as Ohio, while the benefits paid are equal. This would indicate that New York requires more of the smaller employers to comply with their compensation law than does Ohio."

* *J.A.M.A.*, April 13, 1935, Abs. of "Tannic Acid Silver Nitrate Treatment of Burns: Method of Minimizing Shock and Toxemia and Shortening Convalescence," by A. G. Bettman, in *Northwest Medicine*, February 1935, p. 46.

Section on Occupational Diseases

—Massachusetts Safety Conference, Boston, May 6, 1935—

Introductory Remarks by the Chairman

MANFRED BOWDITCH

Director, Massachusetts Division of Occupational Hygiene

THIS is the third successive Massachusetts Safety Conference which has included in its program a section on occupational diseases. In 1933, and again in 1934, the Massachusetts Safety Council was kind enough to invite me, as Occupational Hygienist of the Commonwealth's Department of Labor and Industries, to serve as Chairman of the section. It is said that the third time never fails, and it is a source of no little satisfaction to me, on this third occasion, to be able to announce that the efforts of a decade have finally borne fruit in the creation and establishment of a well-equipped State Division of Occupational Hygiene.

The gratification which those of us who have worked for this end derive from its accomplishment is only in part the normal product of successful effort. Of greater consequence to us is the solidarity of support which assured this success; the fact that, for what I believe to be the first time in their history, the Associated Industries of Massachusetts, the State Federation of Labor, and the Insurance Federation of Massachusetts placed their names to a joint appeal for the passage of legislation. And yet more vital to us is the belief that, in establishing this new service, the state has taken what may well prove to be one of the most important steps in its history for the improvement of working conditions in its industrial and mercantile establishments.

The primary purpose of the Division of Occupational Hygiene is to prevent occupational disease. Because the responsibility for conditions of work lies first of all with the employer, our most important relationship is with the factory owner. Since ours is essentially an advisory, rather than a regulatory function, we are clothed with no power to enter upon anyone's premises or to hail him into court for what we find there. What we *are* prepared and equipped to do is, on receipt of an inquiry from any source, employer, worker, insurance carrier or other agency, as to the likelihood of hazard to health in a given process or material, to determine by technical means the degree of the hazard, and, if one is found, to advise as to the most effective and economical way in which it may be controlled.

Of great present importance to the state and nation are the diseases caused by the inhalation of inorganic dusts. Parenthetically let me say that the widespread damage, financial as well as physical, currently caused by silicosis is in no small measure due to our failure to awaken until recently to certain facts recognized and intelligently acted upon in other parts of the world no less than 30 years ago. Greater in number, if not in material importance, are the poisonings caused by fumes and gases resultant from many of the almost endless variety of chemical substances used in industry. Determination of fume and gas concentrations is the province of the chemist; measurement of dust conditions, and the removal of dusts and gases by means of ventilation, fall within the field of sanitary engineering. The set-up of our little Division therefore includes, besides the director and two clerical workers, a chemist and a sanitary engineer. They are the key men of the Division, and the equipment with which they work represents the greater part of the modest initial investment on which it is now our purpose to pay handsome dividends. The establishment of a new state bureau in a time of business uncertainty places an added responsibility upon its personnel. Technical accuracy in our service to industry is the keystone of our arch, but economy is not and will not be forgotten.

This brief introduction would not be complete without a word of thanks to the many friends in the fields of medicine, engineering, chemistry, labor, industry, insurance, social and governmental work on whom we have drawn heavily for aid and whose continued cooperation we earnestly bespeak. It will, I hope, be understood if I mention only one by name. More than to any one individual, Massachusetts is indebted to the vision, enthusiasm and determination of Edwin S. Smith, formerly our commissioner of labor and industries and now a member of the National Labor Relations Board, for the fact that we have today a Division of Occupational Hygiene.

MR. BOWDITCH—*Introducing Dr. Elkins*: I have said that the technical work of the Division comprises chemistry and engineering. You will now be told of that work in some detail. A statement of the duties of our chemist, prepared in connection with the creation of the position, lists 15 separate functions. It is too long to be read in full at this time, though I think you would find it interesting. The first 12 items might be termed the chemist's routine work. The three which conclude the list are as follows:

13. To critically examine existing analytical methods and develop new methods, especially in the field of microanalysis.

14. To keep abreast of current research in the above subjects and make such contributions thereto as the interest of the Commonwealth warrants.

15. To substitute for the engineer in his absence on vacation or otherwise.

Without further comment, I take pleasure in introducing Dr. Hervey B. Elkins, chemist of the Division of Occupational Hygiene:

The Chemical Work of the Massachusetts Division of Occupational Hygiene

By HERVEY B. ELKINS

Chemist

THE general purposes of the Division have been outlined. The chemical work is concerned primarily with harmful substances, which, when used or present in industry constitute potential occupational hazards; industrial poisons, in other words. By chemical analysis and

similar means the degree of any such hazard can be evaluated, to the end that intelligent control can be applied. Such control may be a chemical problem, a problem in engineering, or a question of common sense.

One of the first questions that the chemical facilities of the Division can aid in answering, then, is this: Will the use of a given substance have any possible ill effect on the health of the worker involved? Such a question can usually be answered by determining the chemical composition of the product in question.

Often this information is readily available and can be obtained with little effort without resort to chemical methods, but this is by no means always the case. Occasionally the manufacturer or agent responsible for the product may not himself know its composition. Recently one of the state institutions was offered a fluid to be used in its laundry as a stain remover. It was sent to the state purchasing laboratory as a precautionary measure, and benzol and carbon tetrachloride, among other ingredients, were found to be present. But the man who compounded the mixture didn't know they were there, having himself used trade products as raw materials. This case involves a very small concern, to be sure, but we have encountered similar, if less striking situations, in dealing with some of the larger companies.

When for any reason the chemical composition of the product is not readily available, it will be found by chemical analysis. The laboratory of the Division is fully equipped to carry out such analyses with a special view to determining qualitatively and quantitatively those constituents that are known to be occupational hazards.

Not only the essential ingredients of products, but also their impurities, may be important from the standpoint of industrial hygiene. Thus arsenic has been in the past, and still is, to a lesser extent, a common impurity in sulphuric and muriatic acids. Under certain conditions such impure acids will liberate arsenic in the form of a highly toxic gas, arseniuretted hydrogen. Of the recorded cases of poisoning by this gas, one in every three has been fatal. Users of these acids should make sure that if arsenic is an impurity the acids are not used in such a manner that arseniuretted hydrogen can escape into the air of the room. Mercury in the fur used for making felt hats is in a similar category.

For determining these small amounts of impurities, as well as for the analysis of air, the laboratory is equipped with rather specialized apparatus for making microchemical analyses. These methods are also used in determining the composition of samples of dust submitted by the engineer of the Division.

When the presence of harmful constituents in a product has been established, the problem is not necessarily solved. Because a material contains toxic ingredients it does not necessarily follow that its use will injure the health of the workers involved. To do this it must first be introduced into the worker's system, if systemic effects are to occur, or it must come in contact with his skin, if local effects, such as dermatitis and conjunctivitis, are to follow.

Now introduction of a poison into the human system may occur mainly in one of three ways: (1) through the mouth and stomach; (2) through the nose and lungs; (3) through the skin. Absorption through the skin to the extent necessary to cause systemic poisoning is confined to certain types of poison. It usually occurs when liquid is spilled onto the skin or clothes and is not washed off. Poisoning through the stomach is rare in industry. This is partly due to the fact that we are all more or less careful about what we eat and drink. It is not so easy to be particular about the air we breathe. Yet a man may eat three or four pounds of food in an entire day, and drink five or six pounds of water in the same period; while if his job requires moderate exertion he will take some 30 pounds of air into his lungs during the eight hours in which he is at work. Thus the purity of the air he breathes may be even more important than that of the food he eats and the water he drinks.

It follows that the most important step in appraising the hazard of a toxic substance used in industry is usually an analysis of the air the workers must breathe. I should like to outline rather briefly the general methods of such analyses.

The simplest method of testing air for toxic vapors and gases requires no apparatus or chemical reagents and is open to nearly every one. I refer to the use of the sense of smell. Many poisonous gases can be readily detected by their characteristic odors. The simplicity of this method is its sole advantage, however. It has many faults. In the first place, not all toxic gases have characteristic odors. Carbon monoxide, which is practically odorless, is the most striking example. In the second place, the nose becomes quickly insensitive and fails to function properly; colds and weather conditions also affect the nose. In the third place, other odors may mask that of the toxic substance. And finally, even under the most favorable circumstances the nose gives only a qualitative test. It may tell us the substance is there, but not how much. And in this work we are vitally interested in quantities.

Then there are other tests that are both simple and direct. These usually involve test papers saturated with a reagent that will change color in the presence of certain gases. Thus pink litmus paper will turn blue if ammonia is present, lead acetate paper will be turned black by hydrogen sulphide, starch iodide paper will be turned blue by chlorine or ozone. By noting the time it takes for these papers to turn to a given shade some idea of the amount of the gas present can be obtained.

But these tests, too, are essentially qualitative tests. Their use is primarily in more or less emergency work. Thus a quick means of determining whether or not the air in a manhole contains carbon monoxide can be very useful. An ampule containing palladium chloride can be employed for this purpose. Test papers for the quick detection of hydrogen cyanide used in fumigation have been developed. Many industries have tanks that must be entered periodically and a rapid method of determining whether or not the air inside is safe might be desirable. We will be glad to cooperate in the development of quick and simple tests of this nature.

But the Division is interested primarily in smaller amounts of impurities, such as may have slow chronic or cumulative effects.Thus lead dust and mercury, benzol and carbon disulphide vapor

are well known causes of chronic poisoning. In some cases a gas or vapor may not be present in a concentration large enough to be harmful, but a partial breakdown of ventilation or similar unforeseen occurrence might increase the amount of a gas to a point where acute poisoning could occur. Moderate gassing for a short period by nitrogen dioxide may have no immediately apparent serious consequences but fatal after effects. Finally small amounts of certain gases and vapors may have no easily traceable effect but under long continued exposure they may sap the vitality and lower the resistance of the worker.

For detecting such situations a reasonably precise method of air analysis is desirable. This means that we must take a definite quantity of air and measure the amount of impurity it contains. We can accomplish this by filling a small tube with the air in question. A tube of 300 to 350 cc. capacity is of a convenient size. The tube can be most easily filled by evacuating it, closing the stopcock and then opening it when in the air to be tested.

Such a method of sampling air is quick and simple and in many cases it is the best method. Its drawback lies in the size of the sample obtained. There is a limit to the smallness of the amount of any material that can be determined by the most refined of methods. The exact limit varies with the substance somewhat, but as a rule we like to have at least a milligram to work with. In as much as a milligram is a forty-thousandth of an ounce I do not think this wish can be considered unreasonable.

Suppose we take a 330 cc. sampling tube into a plant where some harmful vapor is present. If it is only slightly toxic, we are interested only if a fairly large amount is present. If it is highly poisonous, however, it is desirable to discover with certainty the smallest traces. The accompanying table shows our problem more clearly:

Gas	Highest Permissible Concentration in Parts per Million	Mg. in 330 cc.	Volume Required For 1 Mg.	Time Required at 2 Liters Per Minute
Carbon Dioxide	20,000	11	27 cc.	1 second
Carbon Tetrachloride	1600	3	100 cc.	3 seconds
Benzol	100	0.1	3000 cc. or 3.0 liters	1.5 minutes
Hydrogen Cyanide	20	0.007	21 liters	10 minutes
Chlorine	1	0.0008	240 liters	2 hours 20 minutes
Osmium Tetroxide	0.0001	0.0000003	1,000,000 liters	333 days

This table contains data on six gases or vapors encountered in industry, all but one of them being rather common. In the second column is listed the greatest concentration of each gas that will have no apparent effect after long continued exposure. (This concentration is in parts per million by volume. On dividing by 10,000, per cent by volume is obtained.)

The first gas is carbon dioxide. This is not really a toxic gas. It is present to the extent of a hundred to a thousand parts per million in ordinary air. But if there is as much as 20,000 parts per million, or 2%, it may have an appreciable effect on one's breathing. Such a concentration might be encountered in a brewery. If we should take this tube into a brewery and fill it with air containing 20,000 parts per million of carbon dioxide, we would find in the 330 cc. of air contained in the tube 11 mg. of carbon dioxide, an ample quantity to determine with precision.

The next gas, carbon tetrachloride, is more toxic. It may have a serious effect on the liver if taken in over a long period of time. The highest permissible concentration is not too well known, but 1600 parts per million represent the best figures I have available. The sampling tube, used in a plant where carbon tetrachloride is employed as a solvent for a rubber curing liquid, would yield three mg. of carbon tetrachloride if present in this concentration, again enough to determine with fair accuracy by refined methods.

Coming to benzol, as little as 100 parts per million may cause chronic poisoning. If women workers are present, I would tend to set the limit even lower, as they seem to be more susceptible to benzol. If a benzol sealing compound in a cannery is contaminating the air to the extent of 100 parts per million, our tube would yield but a tenth of a milligram, or an amount too small to measure satisfactorily. Hydrogen cyanide and chlorine, present in concentrations of 20 and one parts per million, respectively, could probably not be detected in the amounts contained in 330 cc. of air, namely 0.007 mg. and 0.0008 mg.

Fortunately the last substance in the table, osmium tetroxide, is rarely met in industry. Such a small sample as a third of a millionth of a milligram would be hopeless to work with.

This tube, then, is useful only when dealing with the less toxic gases and vapors. Of course the method can be modified by using a larger container. But even an eight-liter bottle is too large to be carried around conveniently, and it would only extend the range of operations slightly.

Fortunately there is another method of attacking the problem. It is possible to remove the toxic constituents from the air and concentrate them in such a way that their quantity can be readily determined. This can be done in the field, by passing a measured volume of air through some material which will remove the gases or vapors in which we are interested.

A convenient apparatus for this purpose is shown in the pictures (Figs. 1, 2 and 3). A suitcase has been lined with plywood and equipped with legs so that it can be opened without being tipped. Stands for the necessary glassware are made of sheet aluminum, which is light and compact, and can be fastened to the plywood lining of the suitcase. The working parts consist of absorbing bottles or tubes and a flowmeter to measure the rate of flow of air through the apparatus. The air is drawn through by means of a vacuum clean-

er blower or similar source of suction. The units which are shown can be used for any gas which can be absorbed in a dilute aqueous solution. Rates of flow up to five liters per minute can be used with this unit. We usually take samples at two liters a minute, allowing for a margin of safety.

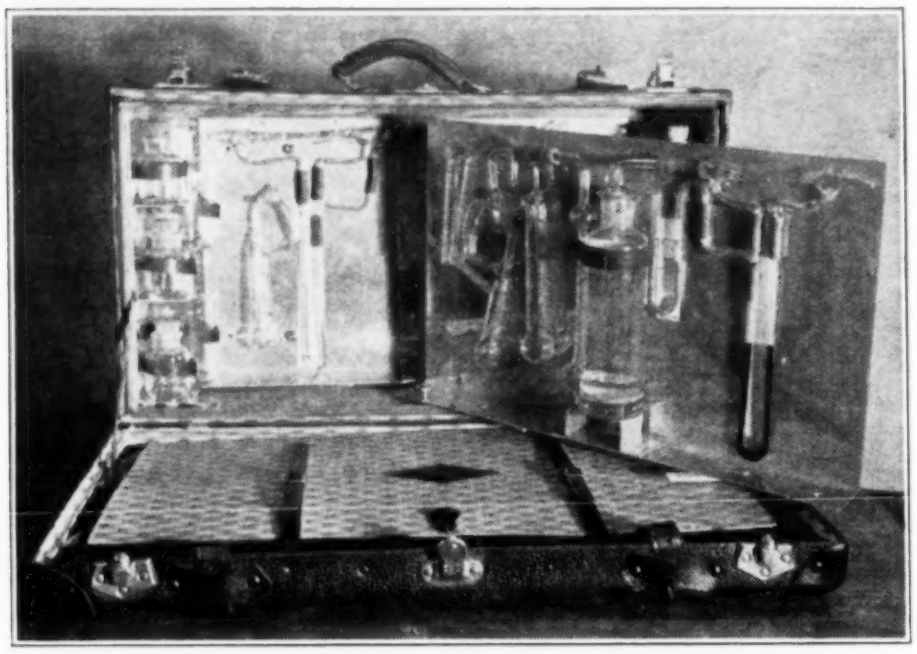

Fig. 1. Suitcase containing two aluminum stands fitted with absorbers and flowmeter

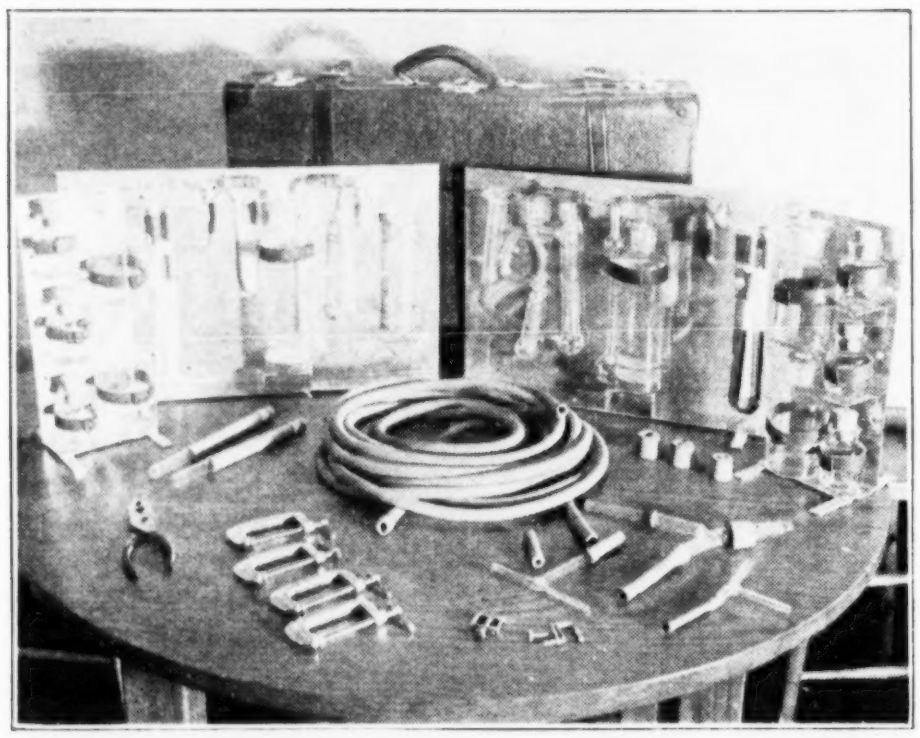

Fig. 2. Showing the total contents of the case

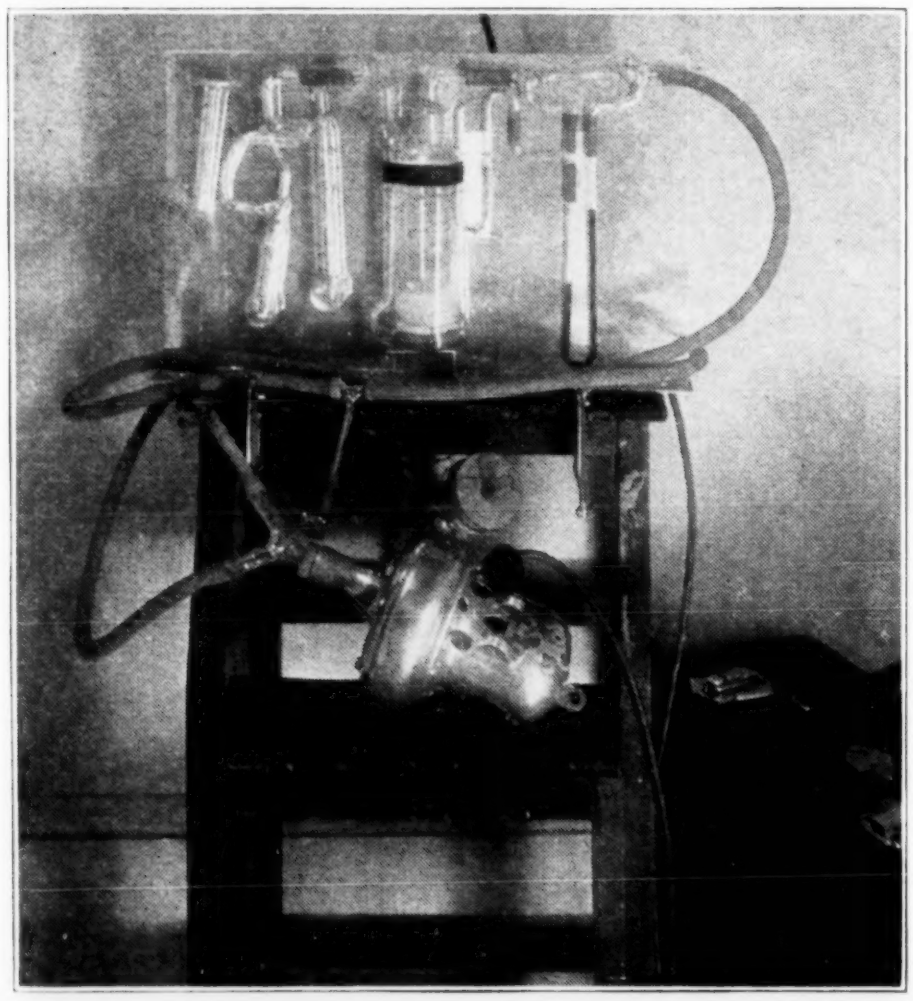

Fig. 3. One of the absorbers in use. The height of the liquid in the flowmeter on the right shows the rate of flow of air through the apparatus

The volume of air needed to yield a milligram of each of the gases discussed, and the time required to obtain such a sample, are shown in the fourth and fifth columns of the table. This method is satisfactory for any of the common gases.

So much for the general methods of air analysis. What purpose do they serve? They tell us whether or not a room or process should have more adequate ventilation. By making tests with ventilating machinery shut down, a check on the efficiency of the ventilating system is obtained. They will often tell what phase of a manufacturing process is most productive of toxic fumes and gases. Thus by isolating or modifying that phase it may be possible to avoid the necessity of expensive installation of ventilating equipment. They will indicate whether or not the ills of the worker are due to impure air or to other causes.

Finally by correlating the data we find with the health of the workers exposed we hope to establish more definitely the effects of small quantities of these gases and vapors on the human system. It may be that continuous exposure to the smallest traces has real, if in most cases imperceptible, deleterious effects. On the other hand, some gases, harmful in high concentrations, may possibly be beneficial in very small amounts. It may be that traces of ammonia and chlorine, for example, are useful in preventing colds, and that small concentrations of sulfur dioxide prevent the occurrence of skin troubles. The information we obtain on such questions will be a valuable by-product of the more immediate practical results.

MR. BOWDITCH—*Introducing Mr. Lehmberg*: The next speaker was, until last week, our engineer. Because of his proficiency in the sanitary engineering field, he was engaged by the department and assigned to special work in Mr. Meade's efficient inspection force, pending the hoped-for creation of the new Division. Now, as a result of that same proficiency, he has again sought pastures new. I take pleasure in introducing Mr. William Howard Lehmberg, of the American Optical Company:

The Engineering Work of the Massachusetts Division of Occupational Hygiene

By WILLIAM HOWARD LEHMBERG
Engineer

THE increasing cost of compensation for pneumoconiosis cases has drawn widespread attention to the medical, engineering and legal aspects of dust diseases. The report of the Special Industrial Disease Commission indicated that silicosis was present in 15.2% of a representative group of granite workers given physical and x-ray examinations; while 7.6% more of the group had silicosis complicated by tuberculosis. In a representative foundry group the relative percentages were respectively 8.8% and 2.6%. During the year ending November, 1934, 28 cases of pneumoconiosis were investigated by the Department of Labor and Industries, and of these 65% were fatal.

The newly created Division, by retaining an industrial sanitary engineer within its personnel and by being equipped with the essential technical apparatus and measuring instruments with which to work, is prepared to assist Massachusetts industry, upon request, in problems of dust measurement and removal, as well as in such other problems of occupational disease control as are of an engineering nature. Employees of the Division possess no police power and their services

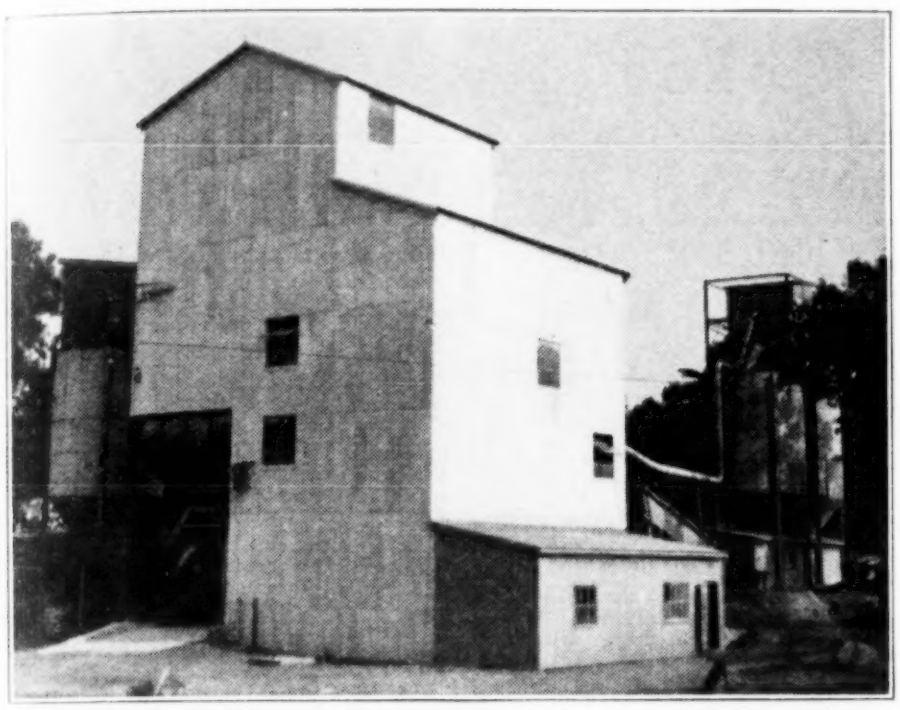

Fig. 1. Entrance view of Bird & Son, Inc. stone crushing plant. The building houses various mechanically ventilated vibrating screens, separators and elevators. The hopper stores the stone after it is crushed to proper size. From here it is either trucked away or conveyed by an enclosed and exhausted belt to the coloring plant

to industry are based primarily upon the industrialist's desire to avail himself of them. Any industry, therefore, operating within the Commonwealth and having or suspecting an industrial disease or health hazard, may apply to the Division for this assistance.

The specific bearing of this quite specialized branch of engineering practice upon problems of industrial hygiene is perhaps not too obvious. General industrial ventilation; dust, gas or fume exhaust ventilation and control; illumination; industrial sanitation; and the testing of dust collectors, separators and various kinds of respiratory and optical protective devices for efficiency all fall within its scope.

Industry, in its efforts to safeguard employees, has too often spent appreciable sums of money for ventilating or exhaust equipment and for protective devices which either were not effective for the purpose, or were unnecessary. With the help of the engineer and the cooperative interest of industry, the Division anticipates correcting this condition, thereby to insure labor of satisfactory working conditions and save management the expense of installing equipment which does not give the required protection.

Of importance in the work of the Division is its estimation of the degree of hazard associated with industrial processes in which dusts are generated. Dust, as used in this sense, implies inhalable dust, that is, dust having a particulate size less than 10 microns in average diameter; a particle size not visible to the naked eye. (One micron is equivalent to one twenty-five thousandth of 1 in.)

The chemical nature of dusts influences their subjective reactions. In general, however, they may be grouped according to their effect upon the human organism into (1) poisonous dusts, (2) irritant dusts and (3) dusts which cause pathological lung disorders. It is the latter group in which we are interested when we speak of pneumoconiosis. The organic dusts are relatively non-injurious when compared with the inorganic or mineral, of which several, when they contain uncombined silicon dioxide, or sometimes combined silica, are known to produce a definite lung fibrosis. Fibrosis is the replacement of elastic lung tissue by inelastic scar tissue. Dusts of granite, quartz, sandstone and siliceous sand, all containing considerable percentages of SiO_2, are examples of those producing the pathological, dusted lung condition called silicosis.

Silicosis is anatomically characterized by generalized fibrotic changes and clinically by decreased chest expansion, shortness of breath, lessened capacity for work and increased susceptibility to tuberculosis. Exposure to asbestos dust, chemically an hydrated silicate of magnesium, in time results in a somewhat similar disease known as asbestosis. These forms of pneumoconiosis, known in some instances to have been contracted after only two or three years' exposure to high concentrations of dust, are apparently incurable, and, in the case of silicosis, frequently result in death from silico-tuberculosis.

In Massachusetts the granite industry, foundry, brake lining, stone crushing and quarrying industries, are among those where inorganic dusts of the nature described are generated; and it is with these dusts that the engineer of the Division is chiefly concerned. Knowing the dust chemically or petrographically, he is able to evaluate the degree to which it is harmful by measuring its concentration and particle size distribution, and by studying the nature of exposure a workman has to the concentration. Control of dust is a specialized engineering problem, and, in so far

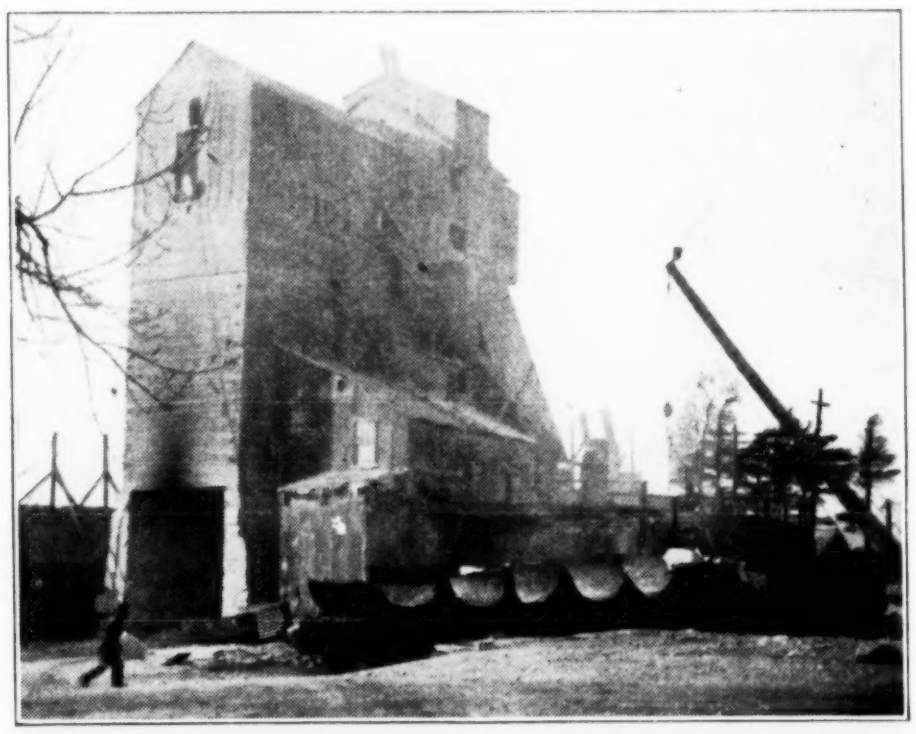

Fig. 2. View of a Massachusetts granite stone crushing plant. Notice the dust cloud—as compared with Fig. 1 which plant is also in operation

as is economically possible, dust should be eliminated at its point of origin by well designed exhaust equipment. By conducting a dust survey, including a study of the dust generating process and the extent or nature of exposure, the engineer is equipped with the essential data with which to evaluate any hazard that may exist, to

evaluate the efficacy of newly installed dust exhaust equipment, to suggest methods of reducing or eliminating dust hazards, or to advise against expenditures for equipment where it is either unnecessary or will not correct the condition.

There are in Massachusetts two notable examples of excellent dust control resulting from the application of specialized engineering principles. One, the completely dust-exhausted stone crushing plant of Bird & Son, Inc., represents the only plant of its kind in the Commonwealth where complete dust control is in effect.

At this plant, crushing quartzite and slate for roofing paper, many worthwhile examples of exhaust ventilation for difficult situations have been developed with the result that an almost unbelievable reduction of dustiness to less than 5,000,000 particles per cubic foot of air has been attained. It is interesting to note that the contract written for this installation specified that the work would not be accepted until dust determinations, made by a consultant retained by Bird & Son, Inc., indicated that the concentrations at all points in the plant were comparable with the standards of permissible dustiness recommended by the U. S. Public Health Service. If this attitude had been adopted by more establishments having dust control equipment installed, there would be in existence today far fewer ineffective or wholly worthless installations.

Fig. 1, an entrance view of the crushing plant, was obtained while it was in full operation. Comparison with Fig. 2, a granite crusher in the state, brings into sharp focus the cleanliness of the former plant.

Fig. 3. View of exhausted, primary gyratory crusher, enclosed exhaust bucket conveyor, primary hoppers, exhaust belt conveyor from hoppers to rotary drier and exhaust ducts leading to filter unit, Bird & Son, Inc. Filter unit has since been equipped with automatic rappers and an exhaust screw drive conveyor for emptying the hoppers

An interesting method of obtaining air-tight flexible connections to vibrating units at the plant is shown in conjunction with an enclosed primary vibratory screen separator. Heavy cloth is wrapped around the joint and painted with asphaltum. These connections, shown in Fig. 4, give the desired flexibility and air tightness and are comparatively inexpensive to install and still less expensive to maintain.

The Westford plant of the H. E. Fletcher Company represents the other notable example of dust control. This recent installation involves the removal of granite dust from pneumatic hand tools and surfacing machines used in the working

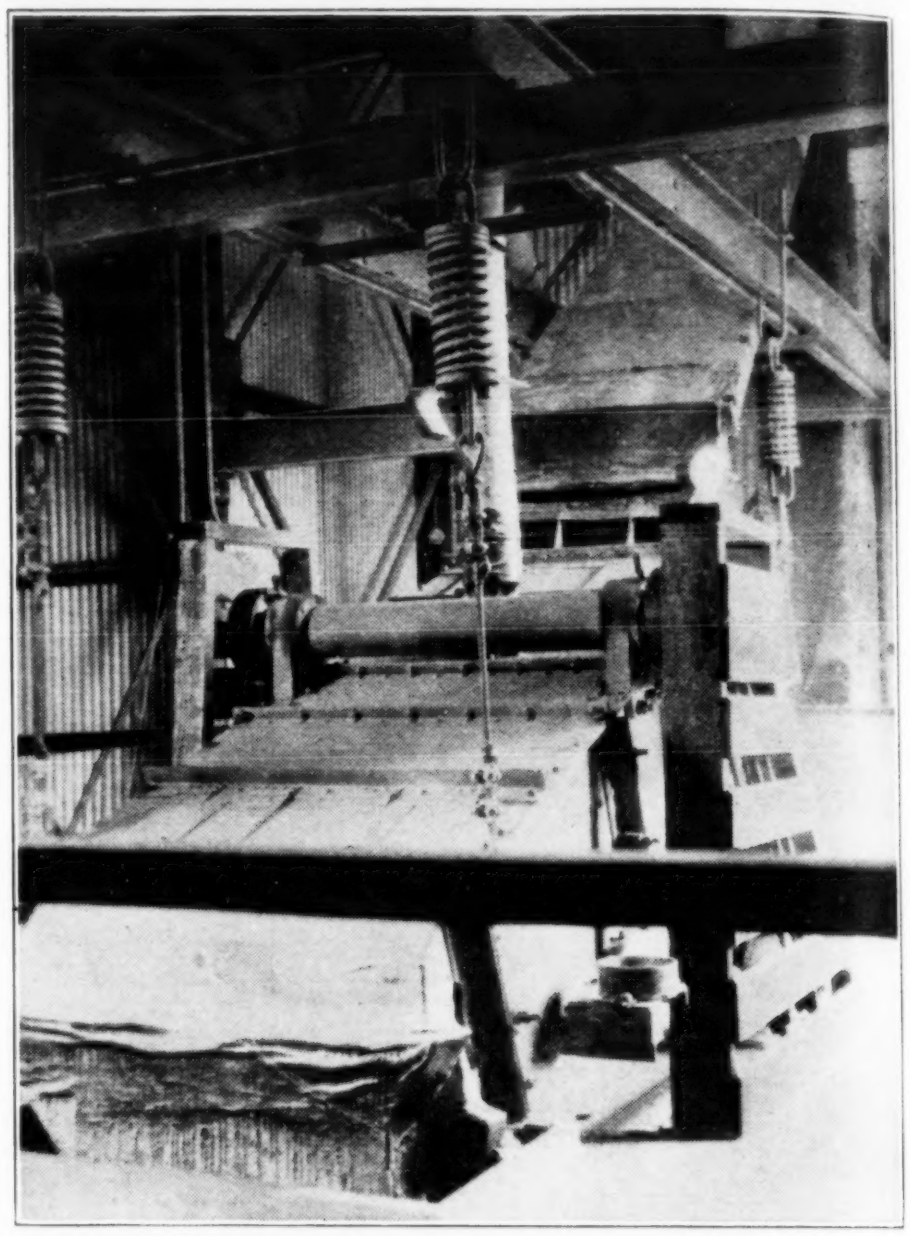

Fig. 4. View of enclosed primary vibratory screen separator building A, Bird & Son, Inc. Note flexible, air-tight connections where ungraded stone enters from rotary drier, at the exhaust duct connection, and where graded stone is discharged to one of three conveyors

of granite blocks for monumental and structural purposes. Fig. 5 shows the system designed for use by pneumatic hand tool workers. The common sense simplicity of the installation, together

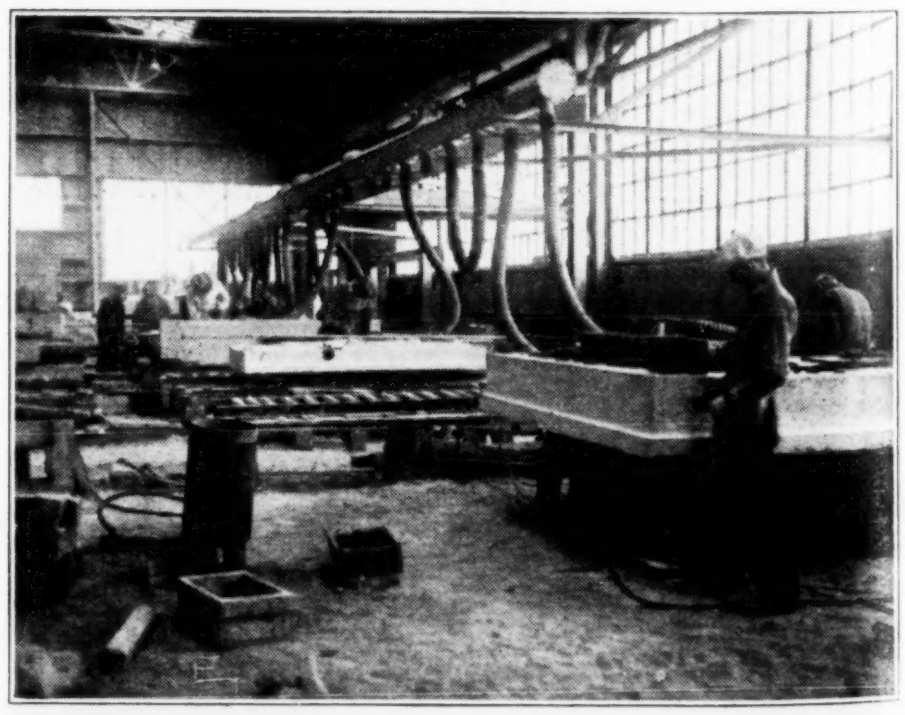

Fig. 5. Exhausts for pneumatic hand tools, H. E. Fletcher Company, Westford plant

with its principles of good design as evidenced by the hood and duct construction, have resulted in an uncumbersome means of maintaining the

dustiness at a point well below the permissible limits for this trade as specified by the U. S. Public Health Service. Fig. 6 shows the filter type dust separator used for collecting the dust taken into this system.

Another installation in the same shed exhausting dust from other hand tools and from surfacing machines is equally noteworthy. Fig. 7 shows a part of this system. It will be noticed that the

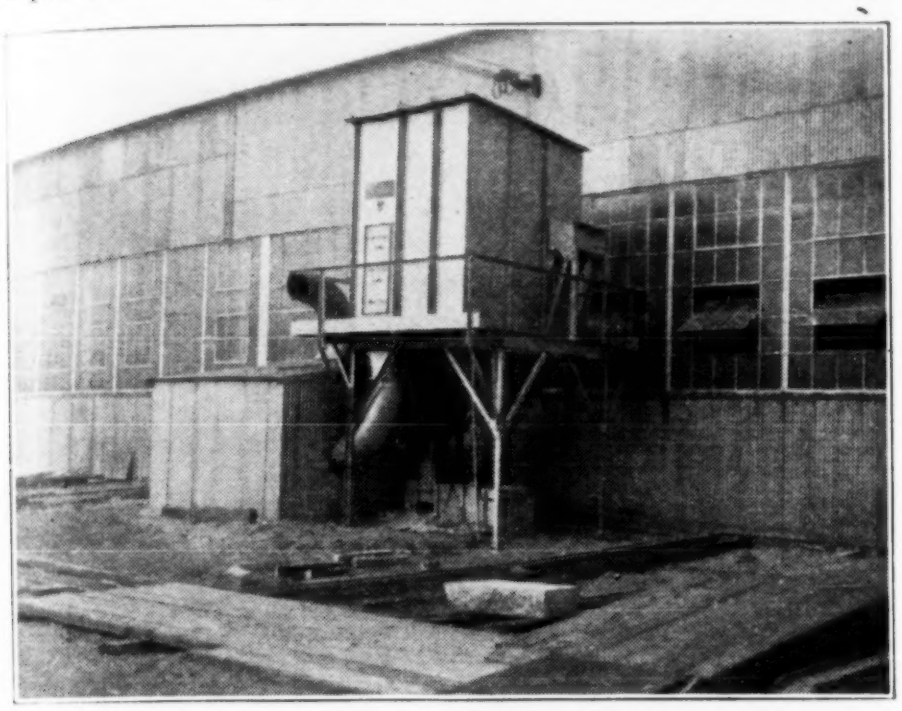

Fig. 6. Filter type dust separator and collector for exhaust shown in Fig. 5

branch ducts lead off from a centrally located mechanical precipitator. The exhaust from this combines with that of a similar unit at a centrally located blower, from which point any dust escaping the collectors is discharged to the outdoors through a tall stack.

While the question of dust control in the large granite plant has been notably answered by this installation, it embodies features quite beyond the range of the small, none-too-adequately capitalized establishment typical of the industry in this state. If the smaller industrial unit and its

Fig. 7. Exhaust for pneumatic hand tools and surfacing machines, H. E. Fletcher Company, Westford plant

workers are to survive, some inexpensive and practical means of removing the injurious dust must be devised.

To achieve results in this direction more quickly then would otherwise be possible, the Division of Occupational Hygiene, in cooperation with the F. E. R. A., has organized a granite dust control project in Quincy, Massachusetts. Engineering supervision is provided by the engineer of the Division, direct supervision and labor by the F. E. R. A., materials and equipment through donations to the trust fund of the project from various interested organizations, such as insurance companies and the granite cutters' union.

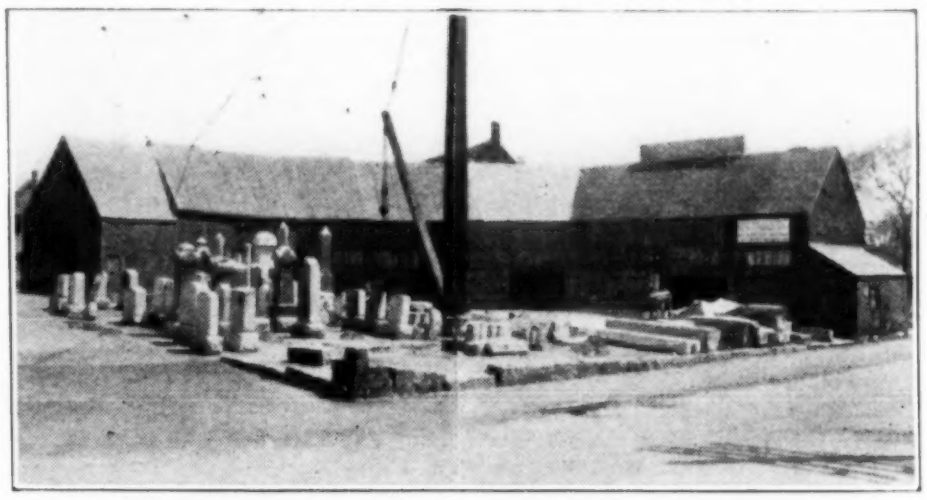

Fig. 8. The monumental granite plant in which the Granite Dust Control Project is being carried on

The project is in its infancy at the present time, but it is proposed, with the services of engineers, technicians, draftsmen, sheet metal workers and granite cutters over a period of about six months, to study, design and erect a series of devices which will remove and collect the dust incident to the various operations of the smaller granite establishment with the greatest efficiency.

A typical granite shed has been loaned to the project; consequently, any results obtained will be under the actual conditions incident to the average small shed. Since the economy of an adequate installation may vary for different size establishments, it is proposed to conduct the research for various sized shops. When the work is completed, the results are to be published, with cost estimates and efficiencies of the several installations. With the results of this study as a basis, the Department of Labor and Industries will, in accordance with Chapter 44 of the Resolves of 1934, draft reasonable rules and regulations applicable to all persons engaged in the Commonwealth granite industry. The ultimate goal of this effort is to create wholesome working conditions for the granite worker and to bring the cost of compensation insurance again within the means of the granite industry.

MR. BOWDITCH — *Introducing Dr. Gray*: Three states have thus far established a bureau for the control of occupational disease. Each calls it by a different name. New York has a Division of Industrial Hygiene with a personnel of over 30. The Connecticut Bureau is small in numbers, but mighty in good works. We in Massachusetts will have no small cause for pride if we equal in the next four years the record made in that short space by the Connecticut Bureau of Occupational Disases. We are fortunate in having with us its able director, who will lead the discussion of the papers which we have just heard: Dr. Albert S. Gray:

Discussion

DR. ALBERT S. GRAY: There is very little of importance that I can add to what the two speakers and Mr. Bowditch have already told you. They have stated that there is a problem and, in the limited time they have had to talk to you, have outlined its possibilities.

We know from Dublin's statistics that three and one-quarter million individuals engaged in manufacturing and mechanical pursuits showed, as a group, several years less longevity than an equally large group of those employed in non-hazardous occupations. The tuberculosis rate in the first group was twice as high, the pneumonia rate was very much higher, and mortality from degenerative diseases (heart disease, kidney disease, etc.), very much higher in the industrial group. One of the things which has greatly concerned public health authorities is this increase in the mortality of degenerative diseases. We are reducing the mortality rate of many diseases, as typhoid fever and diphtheria, but the mortality from degenerative diseases continues to rise. Since these effects upon health have been chiefly ascribed to the industrial environment to which this group is exposed, it is certainly a problem for us to consider very seriously. There are 15,000,000 people in the country who are engaged in manufacturing and mechanical pursuits and the extraction of the minerals. The materials and processes to which they may be exposed and which may affect their health number nearly a thousand. Massachusetts, if I am not mistaken, had, according to the 1930 census, something like 43% of its working population, or about 730,000 persons, so engaged. In our own state there are about 700 different potentially harmful occupations in manufacturing processes. Massachusetts, with its more varied industries, probably includes over 900 of these potentially hazardous occupations, so you can very readily see that there is a tremendous problem to consider. I will briefly recapitulate, if I may be permitted for a moment to do so, what these gentlemen have told you this afternoon. It is important to know the effects of materials and processes on health, and the amounts that will affect the health. We don't know as much as we would like to about threshold doses for these materials. The United States Public Health Service, the Bureau of Mines, and other agencies, have determined some of the threshold doses, but there is room for much more research work on this phase of the problem. In order to establish whether a working environment presents a hazard to health it is essential to have a technical personnel capable of making a job analysis and the necessary physical and chemical determinations of the working environment with the training and experience necessary to interpret their findings.

I do not think that you can consider this problem, with the tremendous number of people involved and the great number of substances which may affect them, and not realize the necessity of a Bureau such as we have in Connecticut and such as you are starting in Massachusetts. Another factor which definitely shows the necessity of a service of this sort is whether or not it is used. I can tell you that in Connecticut the only thing that prevents us from doing more work is lack of personnel. Practically all the work we do is actually requested by industry itself. We have succeeded perhaps to a greater extent than most states in educating the manufacturer to the realization that there are materials that will affect health and that definite measures can be taken to limit such ill effects. You who are here are all safety conscious, but until comparatively recent times we have not been occupational disease conscious. If a man falls off a ladder and breaks a leg, you see what has happened and you do something about it. But there is nothing particularly compelling about a man developing lead poisoning. It is so gradual a process that there is nothing particular to call it to your attention. We have not until recent times realized that here is a vast field for constructive effort. Aside from effect on health and its complications there are other economic considerations. You know that the number of compensation cases for occupational diseases is increasing tremendously and that insurance rates have increased in consequence. In some states occupational disease cases have come to be almost a racket. I have been asked by a number of people recently if a particular disease under consideration has not already attained that distinction. We should be very careful in saying that that is the whole story,—if there is a racket, there is something else as well. Where there is smoke, there is also fire. Unquestionably, a number of phases of the occupational disease problem have grown to be a racket, but it is up to us to realize that there is also a real problem involved that needs constructive methods for its control. There are perhaps a few industries big enough and well enough equipped to handle the broad problem of occupational diseases, but the vast majority of industries are too small. Furthermore, of course, the state cannot abrogate its right to protect the health of its citizens to private interests.

If you succeed in making the investigations of the Division of Occupational Hygiene not subject to subpoena in court or compensation cases, the Division will have very much more work than they can possibly do. The only difficulty will be to get sufficient personnel to take care of the work. We feel in Connecticut that one of the most important factors of our success is the fact that, when an industry comes to us for advice or for a survey, they know that the results of these investigations cannot be used in court cases or compensation hearings. It may at first thought seem unfair, but it really works both ways. When we go into an industry and find conditions very bad there, it is not possible to subpoena these records to show how bad they are, and, on the other hand, they cannot subpoena our records to show how good their place was, either. It is as fair for one side as the other. We have endeavored to establish a service department, primarily for preventive work, and we are not interested in what has happened previously. We are interested in controlling conditions as they exist at the time we go there, so that there will not be any further cases.

This work cannot be done by mere inspection, though you must realize that inspection is a very necessary part of it too. We have had a number of inquiries recently as to how we know whether a dust exposure is safe or not from one dust count. The answer is we don't. We do not decide on one dust count. In addition to impinger samples from which we may adduce average exposure, we take a number, frequently a considerable number, of separate grab samples, so that when we are finished we know not only what the average exposure was during the process, but also what portion of the process contributed to that exposure. Then you must remember another factor, we not only make dust counts and dust analyses, but also make job analyses. For instance, in going to one foundry, I remember that we saw a sand cutting machine at which the dust count was something like 14 million particles per cubic foot of air. At the other end of the foundry was another sand cutting machine, doing the same kind of work, and the dust count was 30 or 40 million particles per cubic foot of air. What was the reason? It was an exactly similar process. At one machine the sand was wetted down and the work was being done as it should be. The other man had not wetted the sand down and was shovelling for dear life, working twice as hard as the other man and thus nearer the sand, almost shovelling it with his nose, so that there was a much greater exposure. I do not want anyone to go away with the idea that we are just getting a dust count at various places and saying that it is therefore safe or not safe. One of the reasons why you want technical men to do this type of work is not only to make dust counts and take dust samples and make job analyses, but also to have sufficient knowledge to properly interpret the results,—to take all of these things into consideration and turn them into terms of occupational disease knowledge.

Second Session

MR. BOWDITCH—*Introducing Dr. vonOettingen*: Mighty in the field of industrial chemicals is the name of Du Pont. The next speaker, a graduate of the Universities of Goettingen and Heidelberg, Germany, in chemistry and medicine, respectively, was until recently a member of the faculty of Western Reserve University at Cleveland, Ohio. He is now associated with the E. I. Du Pont de Nemours Company at Wilmington, Delaware, where, as director of medical research and director of the newly established Haskell Laboratory of Industrial Toxicology, he will no doubt ere long make the Du Pont name mighty in these fields as well. I take pleasure in introducing Dr. W. F. vonOettingen:

Toxic Gases and Vapors

—Their Hazards and Their Control—

by

W. F. vonOettingen, M.D., Dr.P.H.
Director of the Haskell Laboratory of Industrial Toxicology, Wilmington, Delaware

OF ALL accidents of poisoning in our daily life and in industry, those caused by the inhalation of vapors and gases exceed all others in number and frequency. Since in our homes the use of illuminating gas and of automatic refrigeration, using different volatile materials, has become general, the number of poisonings from such gases and vapors has increased considerably and at times has reached an alarming height. The use of the automobile and the vast consumption of gasoline have caused a consequent rise in the incidence of carbon monoxide poisoning. Furthermore, the extensive use of dry cleaning fluids, lacquers and varnishes, paint removers and similar preparations bears a permanent danger to health and life, if improperly used. In our industries the constantly increasing number of solvents and solvent mixtures offers new problems, not to mention the numerous vapors and gases of different natures which are being produced in the course of various chemical processes. Such accidents may appear to be quite harmless, resulting in headache and moderate disturbances, but with continued exposure these may cause severe and permanent injury. The exposure to more toxic agents or to higher concentrations of less harmful compounds, may immediately cause severe injury and may even result in fatal accidents. For this reason it appears to be of paramount importance that we be familiar with the potential dangers resulting from the handling of such compounds under *different conditions* so that we can plan adequate prophylactic measures and devise the proper treatment for injuries resulting from the exposure to such toxic agents.

IN DISCUSSING the different types of toxic gases and vapors, I shall follow the classification as given by Henderson and Haggard in their excellent synopsis on "Noxious Gases." According to these authors, toxic vapors and gases may be classified as asphyxiants, irritants, anesthetics, substances acting on the blood pigment, and inorganic and organo-metallic gases.

Asphyxiants may act either by accumulation of carbon dioxide in the organism or by preventing the absorption of oxygen into the circulation. The symptoms of asphyxia vary considerably with the intensity of the lack of oxygen. If the oxygen in the air is reduced from normally 21% to 16-12%, or slightly beyond the point where a burning candle is extinguished, mental fatigue sets in rapidly and finer muscular movements are interfered with. In this stage the volume of breathing is increased and also the pulse rate. The former causes a decrease of the carbon dioxide in the circulation. When the oxygen of the air is reduced to 14-9%, disturbances of the higher centers of the brain may be observed; the judgment becomes poor, and finally anesthesia and amnesia may develop. Frequently emotional excitement simulating alcoholic intoxication is seen. In this stage even moderate muscular efforts lead rapidly to fatigue, the respiration becomes intermittent and assumes the Cheyne-Stokes type. Further reduction of the oxygen percentage, to 10-6%, causes nausea, vomiting, inability to perform muscular work, and fainting. Reduction to below 6% causes maximal asphyxia, gasping, convulsions, and respiratory paralysis, whereas the heart may continue to beat for a few minutes. If the asphyxia is overcome before the onset of the fourth stage, headache, nausea and general malaise may persist for some time. Depending upon the duration of the asphyxia, more or less severe degenerative changes of the higher nervous centers may result, and the development of pneumonia is not infrequent.

Chronic anoxemia, as observed in high altitudes or with continued exposure to small concentrations of carbon monoxide, causes an increase of the red blood cells—polycythemia—which may be considered as an attempt of the organism to increase the quantity of the oxygen circulating in the organism. This is paralleled by an increased pulmonary ventilation, resulting in a more rapid diminution of carbon dioxide which may lead to alkalosis, headache, nausea and vomiting, a syndrome which has been called "mountain sickness."

Among the asphyxiant gases we may distinguish between *simple* asphyxiants, which prevent the absorption of oxygen by replacing it in the atmosphere, and *chemical asphyxiants.* Illustrations of simple asphyxiants are: nitrogen, the black damp in mines, hydrogen, helium, methane, the marsh gas or fire damp of the mines, ethane, ethylene, acetylene, and nitrous oxide. Representatives of chemical asphyxiants are carbon monoxide, and hydrocyanic acid and its salts. These act by two entirely different mechanisms.

Carbon monoxide is probably the most important industrial poison. It is formed by incomplete combustion of organic compounds such as gasoline, illuminating gas, and many others; it has a great affinity for the red pigment of the blood, the hemoglobin, with which it forms carbon monoxide-hemoglobin and in this way prevents combination with the oxygen in the lungs and thus interferes with the oxygen metabolism.

Insects are not affected by carbon monoxide, cold-blooded animals are comparatively little affected, and in warm-blooded animals the susceptibility varies with the intensity of the oxygen metabolism. Moderate poisoning is caused by inhalation of concentrations of one part per 1,000; 500 parts per 1,000,000 have to be considered as dangerous when inhaled for several hours, and 5,000 parts per 1,000,000 are fatal after 5-10 minutes.

Hydrocyanic acid, on the other hand, and its derivatives, cyanogen, acetonitrile, propionitrile,

ethylisonitrile, benzonitrile, and cyanogen chloride do not affect the blood pigment but prevent the utiliziation of the oxygen by the tissue. With hydrocyanic acid, the most potent poison of this group, concentrations of 20-40 *mg. per liter* cause some toxic effects, whereas concentrations of 300 *mg. per liter* are rapidly fatal. In view of this different mechanism of action of carbon monoxide and hydrocyanic acid the treatment of poisoning by these gases has to be necessarily different. Whereas in the case of carbon monoxide poisoning the carbon monoxide-hemoglobin can be transformed into oxyhemoglobin with the liberal administration of oxygen, preferably in combination with 5% carbon dioxide, cyanide poisoning is only very little improved by this therapy. Although hydrocyanic acid has very little affinity for oxyhemoglobin, it combines readily with its stable isomer, methemoglobin. Therefore, substances such as sodium nitrite and amyl nitrite, which change hemoglobin to methemoglobin are the logical therapeutic agents, especially when combined with sodium thiosulfate or sodium tetrathionate. The intravenous administration of methylene blue, as recommended in recent years, is only indicated in hydrogen cyanide poisoning. It is not only useless but even contraindicated in carbon monoxide poisoning. Its favorable effect in the former instance is presumably partly due to its ability to form methemoglobin; whether or not it has in addition some effect on the cellular oxygen metabolism seems to need further investigation.

As irritants we classify a large number of gases which are commonly used in industries, such as acid fumes, ammonia, chlorine and sulfur dioxide. They may vary widely in physical and chemical properties but they have one characteristic in common, namely, they cause inflammation of the tissue with which they come in contact. Their action is usually restricted to this effect because as a rule they do not enter the circulation to any considerable extent and they are not able to cause injury to other organs by way of the blood stream. Their action is therefore mainly restricted to the surface of the tissue, the skin and the mucous membranes.

The effect of irritant gases varies with the site of their action. With the most irritant compounds it is usually restricted to the upper sections of the respiratory tract and only the less irritant gases penetrate into the deeper sections causing more or less severe pulmonary lesions.

The selective action as far as the site of the injury is concerned depends mainly on the physical and less on the chemical properties of the gases. The effect is generally most marked on tissues which are easily penetrated and which are moist. As for instance, ammonia is a very marked irritant for mucous membranes, being, however, hardly effective on the dry skin. The selective action of gases is, therefore, mainly due to differences in their solubility in water, and as this increases, their detrimental action is usually restricted to the upper respiratory tract. In case the gases are less soluble in water, they are not bound in the upper section, but they penetrate into the lower regions and the pulmonary tissue proper is mainly affected. It may therefore be stated that with decreased solubility the effect becomes more insidious.

In judging on the action of irritant gases one has to distinguish between two effects: inflammation and corrosion. Inflammation occurs in living tissue and is characterized by increased vascularization, edema and pain. Corrosion is characterized by tissue destruction and may also be observed in dead tissue.

The main representatives of irritant gases of the *first group,* those *which act mainly on the upper respiratory tract* are: ammonia, hydrochloric acid, sulfuric acid, hydrogen fluoride and formaldehyde.

Ammonia has a double action; in large concentrations it acts mainly by reflex action on the sensory nerves of the nose, larynx and pharynx, causing a more or less marked stimulation of the medullary centers which may lead to respiratory and cardiac arrest. Smaller concentrations have only an irritant action; concentrations of 408 parts per million cause irritation of the throat; 1,720 parts per million cause cough; 2,500 to 4,500 parts per million should be considered dangerous with exposures for 1½ hours; whereas concentrations of 5,000 to 10,000 parts per million will be rapidly fatal.

Hydrochloric acid is extremely soluble in water and therefore the irritant action of its vapors is usually reduced before they reach the lower sections of the lungs. Concentrations of 10 parts per million may be tolerated with prolonged exposure; 1,000 to 2,000 parts per million must be considered dangerous even with short exposure; and concentrations of 67-100 parts per million should be considered the highest concentration permissible in industrial operations. The irritant action of hydrochloric acid is mainly restricted to the upper respiratory tract; it may be so intense as to cause ulceration and even perforation of the nasal septum. Prolonged exposure to small concentrations may result in systemic effects characterized by cachexia, bronchial catarrh, gastro-intestinal disturbances and discoloration of the teeth, especially of the incisors.

Sulfuric acid has a high boiling point; it is therefore seldom inhaled in the form of vapors, but more frequently in the form of a fine mist. It affects the upper respiratory tract causing coughing by reflex action. 0.1 volume per cent renders the respiration impossible and causes severe irritation of the eyes.

Hydrogen fluoride, a colorless gas used in etching of glass and developed in the manufacturing of artificial fertilizer is much more effective than hydrochloric acid. Both acid and salts are protoplasmic poisons; the inhalation causes marked irritation and ulcers which have little tendency to heal. It causes corrosion of the skin and mucous membranes. The maximal concentration permissible for continuous exposure should not exceed three parts per million, and concentrations of 50-250 parts per million must be considered dangerous, even for short exposures.

Formaldehyde, which is developed during the course of many manufacturing processes and used extensively as an antiseptic and fumigant, has a marked irritant effect on mucous membranes and the skin. There is a wide variation in regard to the susceptibility of different individuals and the fact should be emphasized that a hypersensitivity may be developed.

In the *second group* of irritants are those compounds *which act on the upper respiratory tract*

but which also spread their action to the deeper structures. In this group are classified sulfur dioxide, chlorine, bromine, iodine, acroleine and hydrogen sulfide.

Sulfur dioxide is developed in the course of many chemical processes and is used as a refrigerant, fumigant, and for bleaching purposes. Twenty parts per million is said to be the threshold concentration to cause irritation of the eyes, but 10 parts per million should be the highest concentration allowable for continued exposure. Although the main effect of sulfur dioxide is an irritation of the upper respiratory tract, it may affect also the deeper sections, causing bronchitis and edema of the lungs.

Chlorine which is used and developed extensively in chemical industries is 20 times more toxic than hydrochloric acid, because it reacts with the moisture of the tissue with the formation of hydrochloric acid and oxygen in status nascendi, which also has a marked irritant effect. The susceptibility varies considerably with different individuals. The inhalation favors formation of thrombi and may cause bronchopneumonia. The continued exposure to concentrations of five parts per million may cause a green discoloration of the skin, premature aging, bronchial catarrh and a tendency to pulmonary hemorrhages.

Bromine acts in a similar way to chlorine. It is said to be slightly less injurious to the lungs, whereas iodine is more irritant.

Acroleine, a decomposition and oxidation product of oils and greases, is very irritant to all mucous membranes and to the upper respiratory tract but it may also cause edema of the lungs and is in this respect as dangerous as phosgene. The irritant action is illustrated by the fact that concentrations of 30 parts per million can only be tolerated for one minute exposure.

Hydrogen sulphide is an irritant and systematic poison. It is much more toxic than is usually assumed, especially since it is not generally recognized that in high concentrations the characteristic odor is not noticeable. It is frequently developed in industries. It causes irritation of the whole respiratory tract, irritation of the conjunctiva and ulcerations of the cornea, and is also a potent nerve poison affecting the oxygen metabolism of the cells. Concentrations of 10-15 parts per million will cause conjunctivitis. Aside from its irritant effect, hydrogen sulfide paralyzes the ciliated membranes in the respiratory tract and in this way it interferes with the self defense mechanism.

The *third group* comprises such compounds which *are liable to produce severe pulmonary damages* without causing alarming irritation of the upper respiratory tract. In this group are classified nitrogen peroxide, phosgene, phosphorous trichloride and phosphorous pentachloride. With these substances exposure to small concentrations over a sufficient length of time will cause pulmonary edema. Since it takes hours after the exposure to develop this condition, any individual with a history of exposure to these agents should immediately have absolute rest; as soon as signs of respiratory involvement become manifest, oxygen should be administered freely; in case pulmonary edema develops, the circulation should be improved by bleeding and the action of the heart amended by cardiac stimulants.

THE anesthetic gases may be classified as (1) those which have as a rule no serious after effects, (2) those which are liable to cause organic changes of visceral organs, (3) those which affect the homopoietic system, (4) those which cause more or less severe injury of the nervous structures, and finally (5) nitrogen compounds which mainly affect the blood and the circulation. In regard to the anesthetic action of these gases five stages may be observed. In the first stage the accuracy in the coordination of finer movements is affected; there may be a feeling of dullness, and the performance of work is slower and less efficient. In the second stage there develops usually some confusion and bewilderment; the muscular coordination is seriously disturbed, creating the impression of alcoholic intoxication. This may pass in the next stage into excitement of different intensity, loss of control and of inhibitions. The fourth stage is characterized by unconsciousness and relaxation, and if the patient is not removed from the influence of the gas, this is followed by paralysis of the respiratory center and death.

The anesthetic efficiency varies widely with different compounds, and depends partly on their volatility and partly on their ability to dissolve in lipoids or fats.

In the first group of anesthetic gases, which as a rule have no serious after effects, rank the *aliphatic hydrocarbons* from methane up to decane, whereas the higher homologues are not sufficiently volatile to cause anesthesia. The unsaturated compounds of this group, the olefines, such as ethylene and propylene are only effective in high concentrations and for this reason, as a rule, offer no industrial hazards. The same holds true for acetylene and its homologues as far as the anesthetic action is concerned.

More effective than the hydrocarbons in regard to their anesthetic action are the *ethers* of the aliphatic series. They may cause some pulmonary irritation, resulting in pneumonia, but they are not liable to produce organic changes.

With *aldehydes,* on the other hand, the irritant action is predominant. The lower members of this group formaldehyde and acetaldehyde are very soluble in water, and for this reason are markedly irritant for the upper respiratory tract. On the other hand, the higher homologues which are less soluble in water, are more dangerous for the lower sections of the lungs.

In opposition to the aldehydes, the *ketones* are not markedly irritant to the respiratory tract. They stimulate the respiratory center. Although their acute toxicity, as for instance, that of acetone, may be quite marked, prolonged exposure to low concentrations appears to have no destructive effect on tissues or organs.

The vapors of *esters of aliphatic acids with aliphatic alcohols,* which are used extensively as solvents, do not appear to have a marked poisonous action aside from a slight irritation of the respiratory tract. With the aliphatic esters of *formic acid,* the narcotic action decreases and the irritation increases with their molecular weight. With the esters of acetic acid the methyl derivative causes irritation of the mucous membranes of the eye, nose, and the pharynx, in concentrations of 10,000 parts per million. The ethyl and propyl derivatives are less irritant than the

methyl compound. The butyl ester causes distinct irritation and the isoamyl compound, generally known as amyl acetate, causes local irritation and is only slightly narcotic. Although no permanent injury has been observed from the inhalation of such vapors, it appears possible that they may cause damage to the kidney and liver. The acetic acid ester of cyclohexanol acts qualitatively and quantitatively similar to amyl acetate, although it is three times as toxic; but being nearly six times less volatile, this increased toxicity is antagonized to a certain extent as far as the industrial hazard is concerned.

THE main representatives of anesthetics causing injuries of the visceral organs are the *halogenated hydrocarbons.* These are generally more effective than the hydrocarbons from which they are derived, and, as a rule, the chlorine compounds are more stable than the corresponding bromine and iodine derivatives. The chlorinated hydrocarbons have a less specific effect on nervous structures than the hydrocarbons from which they are derived. The toxic effect is especially marked with the higher homologues, consisting in a depressant action on the heart muscle, degenerative changes of the heart, liver, kidneys, and occasionally also of the pancreas. It is important to know that with these compounds the recovery from the acute effects may be complete, but nevertheless death may occur a few days later from degenerative changes. As a rule the anesthetic action of these compounds increases with the number of chlorine atoms in the molecule, but if all hydrogen atoms are replaced, as in the case of carbon tetrachloride, the efficiency decreases, as illustrated by a comparison of chloroform ($CHCl_3$) and carbon tetrachloride (CCl_4). The toxicity increases with the molecular weight.

The *halogenated methane derivatives*, methyl chloride, iodide and bromide are easily decomposed into methyl alcohol and halogen, the latter combining with the sodium of the blood. Methyl alcohol is not readily oxidized in the organism; it therefore accumulates in the body, and severe methyl alcohol poisoning may result from continued exposure to even small concentrations. The symptoms resulting from the inhalation of such vapors are, therefore: excitement which may pass into convulsions; and gastro-intestinal disturbances characterized by vomiting, diarrhea, and epigastric pain. With the di-, tri-, and tetrachlorine derivatives, which are not hydrolyzed as readily as the mono halogenated compounds, the toxic effect is caused by the molecule. *Chloroform* causes easily a depression of the cardiac muscle and fatty degeneration of the heart and especially of the liver. *Carbon tetrachloride*, which is used extensively as a cleaning fluid and in fire extinguishers, has much less marked anesthetic properties but the toxic effect on the liver is predominant. It should be emphasized that both compounds are liable to form phosgene when in contact with an open flame or hot metal, which will cause severe pulmonary lesions.

With the *halogenated ethyl derivatives*, the mono halogenated compounds are also decomposed after their absorption, but since, in this instance, ethyl alcohol is formed, which is readily oxidized, the accumulating effect observed with the mono halogenated methyl compound is missing. Ethyl chloride has, however, depressant effects on the heart muscle. *Dichlorethylene and ethylene dichloride* have a similar action but are more toxic, causing fatty degeneration of the liver. The former causes burning in the throat, coughing, and later vomiting. Ethylene chloride is less depressant than chloroform; trichlorethane has only a moderate narcotic action, and tetrachlorethane, pentachlorethane and parachlorethylene closely resemble chloroform in their narcotic and toxic action. Of these the tetra and penta chloride have the most marked effect on the liver; heart and kidneys being also readily affected.

The main representatives of the *anesthetic gases affecting the homopoietic system* are the aromatic hydrocarbons such as benzene, toluene and xylene. In man the inhalation of moderate concentrations causes symptoms of alcoholic intoxication, which are, however, only of short duration and pass into progressive depression in the beginning of which, ringing of the ears, nausea, vomiting, headache and unsteady walk are the most conspicuous symptoms. Continued exposure to small concentrations causes headache, fatigue, vertigo, gastro-intestinal disturbances and fever. Such patients show usually a lowering of the blood pressure. They suffer frequently from hemorrhages of the gingiva, the conjunctiva, and from nose bleeding. One of the most common symptoms is also a more or less marked anemia, the fat content of the blood is increased and the blood vessels, the heart, the liver and the kidneys show signs of fatty degeneration. The higher homologues of benzene, toluene and xylene are less dangerous, although presumably not less toxic, on account of their higher boiling point. There are no data available as to the permissible concentration of such vapors in operations on account of the marked variations in individual susceptibility, but 200 to 5,000 parts per million must be considered as toxic and dangerous.

Among the *narcotic gases and vapors causing injury to nervous structures*, the alcohols are the most commonly used. Their toxicity increases with the molecular weight but for practical purposes this is partially offset by their decreased solubility and volatility. An exception to this rule is methyl alcohol which is by far the most toxic on account of its cumulative action. In this group ranks also *carbon disulfide* which is one of the hazards in the rubber and rayon industries. As far as the acute toxicity is concerned, this is of the same intensity as that of chloroform. Chronic poisoning results in polyneuritis, the first symptoms being headache, vertigo, and paraesthesias and gastro-intestinal disturbances. It is very important to know that carbon disulfide may affect the higher centers of the central nervous system causing more or less severe psychic changes. It appears that concentrations of from 320-390 parts per million are already toxic.

THE last group of this series comprises the *organic nitrogen* compounds, the toxicity of which results mainly from their action on the blood and the circulation. Although they belong to the series of hydrocarbons, their anesthetic properties are less marked, and, on account of the nitroso-nitrite and amino group, which they contain, they have quantitatively and qualita-

tively a different effect on the organism from their mother substances. They may be divided into two groups: those compounds which act mainly on the circulation, and those in which the effect on the blood and the blood pigment is predominant.

The main representatives of the first group are the aliphatic nitrites and the alkyl nitro compounds, and the most important representatives are *alkyl nitrite* and *nitro glycerine*. The former is formed during the manufacture of fulminate of mercury. It lowers the blood pressure by direct action on the peripheral blood vessels, but, unless the exposure is continued over a long time, this effect is neither lasting nor of a severe nature.

Substances which act mainly by changing the blood pigment to methemoglobin are the *aromatic nitro and amino compounds*. The former are extensively used in the manufacture of explosives. On account of their low volatility the concentration of vapors in the operations is usually too low to cause alarming symptoms. Severe poisoning may, however, occur from absorption through the skin and from inhalation of the dust.

With *nitrobenzene* acute poisoning is only observed from the inhalation of concentrated vapors. It is characterized by loss of consciousness and paralysis, the narcotic effects being predominant. Continued exposure to lower concentrations usually does not produce an immediate effect, and only after some time elapses does methemoglobin formation suddenly set in. The patients become cyanotic, and, if the exposure is sufficiently long, more or less marked asphyxia may result. Occasionally the poisoning may be followed by fatty degeneration of the liver. The first symptoms may be observed after exposure to concentrations of 200 parts per million.

Dinitro and trinitro benzene have approximately the same degree of toxicity; they are more irritant to the skin and are liable to cause dermatitis and eczema.

The higher homologues of nitro benzene, ortho, para and meta nitrotoluene are less toxic than nitro benzene. Only with prolonged exposure will they cause methemoglobin formation and anemia. The minimal dangerous concentration has not been established, on account of considerable variations of the individual sensitivity.

Exposure to vapors and dust of *2:4 dinitrotoluene* may cause headache and a light cyanosis. It is interesting and may be of importance that workers exposed to this compound develop a reduced resistance to alcohol and are liable to respond with excitation to moderate doses which usually are not effective.

Trinitrotoluene is less toxic than the mono- and di- substituted compounds, but it may cause more or less severe irritation of the skin. It is, however, questionable whether this is caused by the trinitrotoluene proper or whether it is not due to its contamination with tetranitro methane.

The *mono-, di-, and trinitro xylenes* are less toxic than the lower homologues and less liable to produce toxic effects in operations.

Among the nitro phenols, *trinitrophenol*, picric acid, is the most important. Uusually it causes only a more or less marked irritation of the skin and the mucous membranes. Its presence is easily detected by a bitter taste in the mouth. It causes a yellow discoloration of the skin and hair, irritation of the skin resulting in eczema and severe toxidermias. Systemic symptoms are comparatively rare and consist of gastro-intestinal disturbances, bronchitis and fever, and peripheral neuritis; paraesthesias of the lower extremities have also been observed.

The main representative of the aromatic amines is *aniline*, which is used extensively in the dye and rubber industries. Toxic effects may result from the inhalation of the vapors and by direct contact with the skin. Exposure to concentrations of 7-26 parts per million will cause slight toxic symptoms. In mild cases, cyanosis, due to formation of methemoglobin, and excitation resembling alcoholic intoxication, may be the only symptoms. In more severe cases the cyanosis is more marked, the patients complain about headache, fatigue, lack of appetite, unsteady gait, vertigo, difficulties in speaking, and irritation of the bladder which may pass into cystitis with bloody urine. In severe cases the effect on the central nervous system becomes more marked and the cyanosis is very intense. In the beginning the pulse rate and the blood pressure are increased, but in the later stages both are reduced and the respiration becomes frequent and irregular. The patients complain about lack of appetite, thirst, and dryness of the throat; nausea and vomiting may develop; occasionally the urine contains blood and complaints are made about pains in the joints and muscles. Disturbances of sensory function, such as sensitivity, vision, and speech, are also occasionally observed. In extreme cases of aniline poisoning the patient becomes suddenly unconscious, the skin is markedly cyanotic, the pulse and the respiration are superficial and frequent, convulsions may develop, and death results from respiratory paralysis. Aniline is not liable to cause local irritation. With chronic poisoning, pallor, cyanosis, a slow pulse and an increase of the blocd pressure are the most characteristic symptoms; gastro-intestinal disturbances and bloody urine are also occasionally seen. Like benzidine and beta-naphthylamine, aniline is said to cause tumors of the bladder. These may appear only after prolonged exposure to the toxic agent and may develop even when the exposure has been discontinued for years.

THE last group of toxic gases and vapors comprises the *inorganic* and *organo-metallic compounds*, i.e., chemicals containing phosphorus, mercury, lead and arsenic.

Phosphorus in the form of yellow phosphorus was formerly used extensively in the manufacture of matches and is still employed as an ingredient of pyrotechnics and rodent exterminators. The continued inhalation of the vapors causes a garlic like odor of the exhaled air, yellow discoloration of the conjunctiva, necrosis of the bones, particularly of the jaw, and fatty degeneration of the visceral organs, especially of the liver.

Phosphorus hydride (PH_3) or phosphine, as liberated in the preparation of phosphorus and of phosphorus sesquisulfide and also from calcium carbide contaminated with calcium phosphide, causes, when inhaled, pain in the region of the diaphragm and a feeling of cold. With moderate degrees of poisoning, pain in the chest, fear, asphyxia, dry cough, dizziness, ringing in the ears, and loss of appetite and fainting are the main

symptoms. In severe cases a progressive depression develops, the gait becomes unsteady, certain muscle groups may show twitchings, and the pupils are dilated. Death may result after hours or days.

The chlorine derivatives of phosphorus, phosphorous tri- and pentachloride are very irritant to mucous membranes and to the skin.

Poisoning from *mercury vapors* may result from breaking of mercury lamps, from the explosion and handling of fulminate of mercury, and from the careless use of insecticides and fungicides containing mercury. The toxic action of mercury may result from the inhalation of the vapor or from absorption through the skin. There are only quantitative differences between metallic mercury and its organic and inorganic compounds. Chronic mercury poisoning may also result from careless handling of metallic mercury in laboratories, in operations where high vacuum mercury pumps are used and in the manufacture of amalgams. Frequently it is observed in miners handling mercury ores and in operations where gold is recovered by means of the amalgam process. Acute poisoning is rare, and mostly results from accidents in the operation. The main symptoms are a characteristic metallic taste, nausea, abdominal pain, diarrhea; and nephritis, stomatitis, and gingivitis may develop if the patient lives for a sufficient length of time. In chronic mercury poisoning loss of appetite, stomatitis, salivation, anemia, nervousness, tremors and pain in the limbs are the most common symptoms. Sooner or later nephritis and cachexia, and occasionally also psychic symptoms, develop, and the patient dies from malnutrition and disturbances of the kidney function.

In discussing the toxicity of organo-metallic vapors and gases, *tetra ethyl lead* may be mentioned as the most important representative of the volatile lead compounds. Exposure to high concentrations resulting in acute poisoning is usually rapidly fatal, causing very severe nervous, circulatory, and gastro-intestinal disturbances and also psychic effects of the maniacal type. With chronic poisoning the symptoms are essentially the same as observed in chronic lead poisoning, the patients developing pallor, anemia, neuritis, and gastro-intestinal disturbances, such as colic and diarrhea.

Another gas which belongs in this group is *nickel carbonyl*, which is formed during the preparation of nickel. Even small concentrations cause a marked irritation of the lungs as indicated by coughing and asphyxia; it may lead to edema of the lungs or pneumonia. In the beginning the patients complain of a headache, and the body temperature is lowered; in the later stages fever may set in. With nickel carbonyl 1,000 parts per million are considered to be dangerous.

Arsenated hydrogen is formed by the action of arsenic-containing-acids on metals or from arsenic-containing-ores. It causes hemolysis of the blood, and may also affect the central nervous system. In light cases of acute poisoning the main complaints are headache and nausea; in the moderate cases, fatigue, nausea, headache, vertigo and vomiting; and after a period of several days icterus may develop, caused by the destruction of blood cells. In severe cases all these symptoms are more pronounced; circulatory disturbances and disfunctionation of the kidneys may become manifest, and death may occur within a week with delirium and convulsions and occasionally also from edema of the lungs. Postmortem examination frequently reveals fatty degeneration of the visceral organs. Exposure for several hours to concentrations of 3.1 parts per million may cause toxic effects.

IN DISCUSSING the *prevention of accidents* resulting from the exposure to toxic gases and vapors one has to distinguish between hazards within the operation and dangers resulting from accidents and irregularities in the operation. Adequate prophylactic measures require a detailed knowledge of the mechanism of action of the toxic agents, and further it is necessary that any preventive measures be strictly observed.

The personal hygiene of the workmen, such as washing before meals, changing of clothes before and after entering the operation, and so on, is less effective in preventing accidents from inhalation of toxic vapors and gases than from absorption through the skin and the oral administration with foods. For this reason proper ventilation of the working rooms and of the individual operations is imperative. In planning this, the character of the toxic materials, whether light or heavy, should be considered, and care should be taken that they are not only removed from the operation but that they are also removed in such a way that they do not contaminate the surroundings. If possible, the process of manufacturing should be planned in such a way that the use of other protective measures, such as the wearing of gas masks, becomes unnecessary. The efficiency of such measures should be controlled by repeated analysis of the air and the suspension of test papers in the operations.

In this way ozone may be detected by means of filter paper saturated with manganese sulfate or thallous oxide, which turns brown in the presence of this gas.

Chlorine may be detected by the use of potassium iodide-starch paper which turns dark blue after three to five seconds in concentrations of five parts per million, and which shows a light blue color after 10 seconds when the concentration is 0.5 part per million.

Filter paper saturated with fuchsin in sulfurous acid will turn blue in the presence of bromine.

Hydrogen sulfide may be detected by means of lead acetate paper; with this, however, the darkening may not be permanent when exposed to very high dilutions.

Sodium iodate-starch paper is turned blue by sulfur dioxide.

Nitrogen oxides may be detected by means of potassium iodide-starch paper and litmus paper. The former turns blue and the latter red. Concentrations of 100 parts per million will give a dark blue color after 15 seconds.

Phosphorus hydride darkens paper saturated with silver nitrate but not lead acetate paper; and arsenated hydrogen darkens silver nitrate and mercuric chloride paper.

Carbon monoxide may be detected by means of paper saturated with palladous chloride which is darkened immediately in concentrations of 0.76% and after one minute in concentrations of 0.076%. Using a mixture containing 0.78 gm. of palladous chloride and 0.25 gm. aurous chloride per liter,

quantities of 0.001% of carbon monoxide may be detected in the air.

For hydrocyanic acid and its volatile derivatives filter paper saturated with a mixture of two solutions, one containing 2.86 gm. of calcium acetate per liter of water and the other consisting of an aqueous semisaturated solution of benzidine acetate, has been suggested. This will show immediately a dark blue color in the presence of 63 parts per million; half this concentration will give a light blue color and this is only very faint in concentrations of 13 to 20 parts per million.

Aniline vapor may be detected by the purple color produced on pieces of cloth saturated with aluminum chlorate and vanadium chloride.

In case of accidents, where the toxic concentration is usually high, the use of gas masks and of proper garments will be necessary. There are three types of gas masks; each has its merits and disadvantages and its field of usefulness. The *oxygen gas mask* allows the carrier to inhale oxygen from a tank or that developed in a canister. It has the advantage that it permits the carrier to enter rooms where no oxygen for the respiration is available; it also allows free moving around, but it is quite bulky. With the *fresh air mask* the oxygen is supplied through a rubber tubing from the fresh air. It has the advantage that it allows unlimited sojourn in the poisoned area, but it has only a limited radius of action. The third type is the *filter gas mask*, which can only be used when sufficient oxygen is present. It has the advantage of making the carrier independent of the surroundings; it is less bulky than the oxygen mask, but it has only a limited life, so that the filter has to be renewed at intervals. The filter material which serves to remove the toxic gases varies in its composition for different gases; by the proper combination of such materials an "all service gas mask" may be created. Organic vapors and solvents will be retained by activated charcoal; acid fumes, nitrogen oxides and halogens are absorbed by a mixture of activated charcoal and diatomite saturated with potassium chlorate, hexamethylene tetramine and complex zinc salts; and sulfur dioxide is bound by potassium carbonate. For hydrocyanic acid a filling consisting of diatomite impregnated with complex metallic salts and alkalies is used; ammonia may be retained by activated charcoal, and hydrogen sulfide by the oxide of heavy metals; these in combination with activated charcoal will also absorb arsenated and phosphoretted hydrogen. For the absorption of carbon monoxide hopcalite, a mixture of metal oxides, is used, which, by means of catalysis, oxidizes this gas to carbon dioxide.

In using gas masks it is essential that these fit the face of the wearer tightly, which means that each man has to have his own mask assigned. It is further important that the men are familiar with the use of the mask, and that they realize the length of time for which they offer protection. For these reasons the masks should be tested from time to time in regard to their fit and the condition of their filters.

For the prevention of accidents and the reduction of industrial hazards it is also essential that the workmen be selected in regard to their prospective operations. In operations where the health hazards concern mainly the circulation and the functionation of the heart, men suffering from cardiac troubles, such as decompensation and fatty degeneration of the heart muscle or diseases of the blood vessels, should be excluded. This refers, for instance, to such operations as where halogenated hydrocarbons, nitrites and aliphatic nitro compounds are handled.

In processes where irritant gases and vapors are produced, men suffering from pulmonary lesions such as tuberculosis, bronchitis and silicosis should be excluded, because any irritation of the respiratory tract may cause a flare-up of this condition.

It should also be taken into consideration that the sensitivity to certain agents may vary considerably with different individuals. As a rule, young persons and especially women are more susceptible than mature male persons. In the former the resistance of the tissue is lower; its permeability is greater, and for this reason the reactions are more marked and systemic and reflex actions are more pronounced. This holds true especially for those operations where benzene, aniline, ammonia and halogenated hydrocarbons are used.

Aside from this natural hypersensitivity, a hypersensitivity can also be acquired after prolonged exposure to certain agents, as has been observed with formaldehyde, oil of turpentine, and the aromatic nitro and amino compounds. Such individuals should be transferred to another operation.

For the prevention of accidents it is very important that the workmen are properly instructed in regard to the potential dangers of their operation, and as a rule they should be familiar with hazards and the first toxic symptoms. There is, however, one group of workmen where this frequently does not hold true. These are the repair men and construction workers, who in our experience are more frequently than others the victims of such accidents. For this reason they should have a detailed instruction on the potential hazards of each operation in which they are working, they should work under close supervision of a man who is not only familiar with the potential dangers, and the symptoms of possible poisoning, but who is also trained and equipped for first aid treatment. If the work requires that tanks, pits and other closed rooms be entered through a small opening, arrangements should be made so that the man can be removed to safety without risking the life of another person.

SO FAR as the treatment of poisonings from toxic vapors and gases is concerned, the scope of this paper allows only mention of general measures, because the symptoms will vary from case to case, and their treatment will be guided to a great extent by clinical conditions.

In any event, the patient should be transferred to fresh air as soon as possible; any exposure to low temperatures or cooling off should be avoided by wrapping in warm blankets. If necessary, oxygen should be administered, preferably in combination with 5% carbon dioxide, and artificial respiration should be given, which, however, has also its contraindications. This holds especially true for poisonings from irritant gas; here artificial respiration may cause severe injury to the inflamed and edematous tissue. Absolute rest for at least 24 hours is the paramount requisite. Inhalation of diluted ammonia vapors or of ammonium carbonate is usually of no value because the

damage has already been done. The irritant effect of gases and vapors to the skin may be reduced by weak alkalies, such as sodium bicarbonate, and sodium borate solutions in case of acids, and by oxidizing agents, such as chlorinated lime, chloramine and Dakin's solution if organic compounds such as dichlorethylsulfide are the cause. The removal of the irritant material by means of solvents bears the great danger that these may enhance the spreading and the absorption of the toxic agent.

Lesions of the eye should be treated by abundant lavage with lukewarm water or physiological saline; later bland ointments may be applied.

With a number of chemicals, such as lead and mercury compounds, the halogenated methyl derivatives, phosphorus hydrogen and arsenated hydrogen, one should not be misled by the latent period characteristic for these compounds. This should be used for protective measures.

Shock, a state of depression in which the consciousness is preserved, usually requires rest and fresh air, and any unnecessary medication should be avoided.

Collapse, which in addition is characterized by loss of consciousness, is mostly due to sudden weakening of the heart and simultaneous vascular dilation of large areas. In gas poisoning this is frequently caused by an acute hyperemia of the lungs or by paralysis of the vasomotor center, causing fall of the blood pressure and secondarily cardiac failure. In this case transfer to fresh air, lowering of the head and reflex stimuli are sometimes sufficient to improve the condition; or symptomatic treatment under medical supervision will be required.

In cyanosis, as observed with exposure to aniline, aromatic nitro compounds and alkyl nitrites, the administration of oxygen is the first prerequisite. These patients have to be watched carefully because acute cardiac failure may develop suddenly.

The treatment of chronic poisoning needs no discussion in this connection because this requires in every instance medical attention.

In dealing with industrial accidents caused by inhalation of toxic vapors and gases one has to consider also the possibility of the formation of secondary toxic products. Pure narcotic gases such as the vapors of chloroform, trichlorethylene, and carbon tetrachloride, when in contact with an open flame or hot metal will form carbon oxychloride, phosgene, the inhalation of which will give an entirely different picture from what one would expect from the knowledge of the effects of the mother substances. It must further be kept in mind that many substances, such as certain mercury compounds and oxalic acid, are volatile with steam, and thus unexpectedly may give rise to acute and chronic poisoning. In addition it has to be remembered that many substances used in chemical industries are not chemically pure. It has been mentioned that the irritation caused by trinitrotoluene is presumably, at least in part, due to its contamination with tetranitromethane. Frequently technical acids are contaminated with arsenic; in contact with metals these will develop arsenated hydrogen, and the gas will be developed when metals such as zinc containing arsenic are treated with acids.

Another fact which frequently is not recognized is that many substances are comparatively harmless and non-toxic in fairly large single doses, or that gases are so irritant in concentrations causing acute effects, that persons are induced to leave the room, but that the continued exposure to low concentrations of the same compound will result in severe and sometimes irreparable damage. As, for instance, ethylene glycol is comparatively non toxic in single doses, but when even small quantities are ingested day after day, very severe histological changes of the kidney will result. The reason is that this compound is oxidized to oxalic acid in the organism, the continued excretion of which will cause severe irritation and degeneration of the renal tissue. A similar effect is produced by the inhalation of dioxan and ethylene oxide. Both are known to cause irritation when inhaled in sufficiently high concentrations. It has been assumed that this would act as an alarm signal, but it has been demonstrated that continued exposure to solutions which cause no irritation or discomfort, will cause severe injury to the visceral organs.

IN THE foregoing, only the most important chemical compounds have been discussed, the vapors of which may give rise to poisoning. Their number could be increased considerably. In the research laboratories of our chemical industries daily new compounds and processes are being developed. These have to be studied in regard to their toxicity and the mechanism of their action, so that adequate preventive measures can be taken in order to prevent accidents when these compounds are manufactured on a large scale. On the other hand it has been pointed out that it is essential to select the workmen in regard to their physical fitness for certain operations. This requires a very careful examination of each person entering the service, even to the extent that x-ray pictures of the chest be taken, and these should be supplemented by periodical physical examinations. In these examinations special attention should be paid to the hazards and their symptomatic effects characteristic for certain operations, so that various clinical tests may be performed with a limited number of men only, which would render the results of such examinations more valuable and at the same time would not be too time-consuming.

Finally, each large plant should maintain, perhaps in connection with the fire department, a group of men familiar with the hazards in different areas, who are trained in first aid treatment of any accidents which might be expected in such districts and who are equipped with the necessary instruments and apparatus. These men should be available as first aids in accidents, and they should be present when cleaning and repair work are done in these operations. Only if these precautions are observed and enforced, will the incidence of poisoning from toxic gases and vapors be reduced.

MR. BOWDITCH — *Introducing Professor Drinker*: The leader of our final discussion is no doubt known to most of you as a teacher of industrial hygiene, as a consultant in the field of dust suppression, or as the inventor of a remarkable device for saving the lives of infantile paralysis victims. In addition to these attain-

ments, he is, as you may not know, a deep sea fisherman of no mean ability and an archer second only to Robin Hood. I will now ask him to fish some of the more important points from the able paper to which we have just listened and direct at them the friendly arrows of his intellect. Professor Drinker:

Discussion

PROF. DRINKER: I am sure that there is little I can add to Dr. vonOettingen's very able paper. To me as an engineer there is one factor in the inhalation of toxic substances that is of special consequence. Why is the problem of inhalation so much more severe than the problem of swallowing? The answer is brought out clearly in dust problems. Lead poisoning is rated as 10 times more apt to occur from breathing lead dust than from swallowing it. The liver filters out swallowed substances like lead dusts, and removes them from the blood before harm can be done. If they are breathed, they are taken up by the blood stream, pumped all over the body, and thus make themselves felt more readily than would otherwise be possible. Solvent vapors such as Dr. vonOettingen speaks of are taken in by breathing, circulated in the blood, and the problem is thus largely a question of their solubility in the blood. Therefore chemists and physicists can contribute valuable information by determining the solubility of these substances in blood. That is one of the first things the chemical companies manufacturing new materials should do. They can also determine explosive limits when mixed with air and finally their toxicity.

Prevention of accidents from breathing these substances and the use of protective apparatus and gas masks were discussed by Dr. vonOettingen. I should like to mention another protective appliance, the small so-called chemical cartridge, which is not a true gas mask canister but a small cartridge filled with an absorbent like charcoal or soda lime. Generally these cartridges are not effective against lethal concentrations of gases but are safe against low concentrations, which are much more apt to occur in industry than are lethal concentrations.

The solvent recovery plants developed in the late war for capturing vapors of solvents used for the manufacture of certain explosives and of airplane dopes generally turned out to be a profitable investment. Today an industry with a toxic solvent hazard will do well to determine whether solvent vapors can not be recovered profitably, rather than be wasted. Obviously, if a plant for capturing solvent vapors operates profitably, it ceases to be an expensive annoyance to the plant management.

In closing, I wish to express my sincere admiration for the forward step taken by the Du Pont Company in the creation of the Haskell Laboratory. I know of no firm anywhere in the world that has had the courage and foresight to take such a step, and for this reason alone I was delighted to hear Dr. vonOettingen's paper.

Skin Hazards

THE United States Public Health Service has recently issued the first of a series of publications dealing with skin hazards in American industries.*

This report includes candy making, synthetic dye manufacture, oil refining, rubber industry, manufacture of linseed oil, and studies of outbreaks of dermatitis among silk throwsters, insecticide manufacturers, and perfume bottlers.

Candy making. In the candy industry over 1,200 workers in four factories were examined and the processes studied. The chief skin hazards were found to be burns in hard-candy making and dermatitis from flavoring oils and sugar. A case of hypersensitivity to chocolate is also described.

Synthetic dye manufacture. In synthetic dye manufacture, 3,800 workers in five dye manufacturing establishments were examined. Processes of dye manufacture are described, and the chief irritants are listed. It was found that most of the finished dyes are not irritants, but that many of the intermediates are powerful skin irritants. Methods of prevention are outlined.

Rubber. This study was based on investigations in seven large rubber manufacturing companies employing about 30,000 workers. A brief review of literature on dermattitis in the industry is given, and the process of rubber manufacture is briefly described. The chief accelerators and antioxidants used are named. Dermatitis due to pure rubber is rare, but dermatitis caused by the compounds in rubber is fairly frequent. It is due not so much to the fact that these compounds are skin irritants as to the hypersensitivity of the workers to them. The workers compounding and handling the unvulcanized rubber are mostly affected. The cured rubber is seldom a cause of dermatitis. When it is, it is usually caused by "blooming out" of excess of accelerator or antioxidant. Preventive measures are outlined.

Linseed oil manufacture. An outbreak of dermatitis in the manufacture of linseed oil is described. The chief irritants in this industry are as follows:

1. Irritation from the sharp points of the linseed itself;
2. Bites of parasites in the linseed;
3. Cuts from filter cloths made of human Chinese hair; and
4. Hypersensitivity to the linseed oil itself.

Methods of prevention are given and literature on the subject is reviewed.

Dermatitis among slik throwsters. The report describes an outbreak of dermatitis in a silk-throwing factory which was found to be due to the hypersensitivity of the handlers of wet silk to the wetting solution. Solution contained soap made of olive oil foots and antimildew, containing cresol.

Insecticide manufacture. Investigation was made of an outbreak of dermatitis in an insecticide factory caused by petroleum distillate extracts of the Japanese daisy. Patch tests showed that the trouble was due to the irritating effects of pyrethrum, on which the insecticidal action of these flowers depends.

Perfume bottling. An outbreak of dermatitis in a perfume bottling plant was found to be caused by essential oils containing a terpene alcohol, "inalool."

*U. S. Public Health Reports, Vol. 50, o. 11, March 15, 1935.

Opportunity

IN THE last 10 years what is in some measure an entirely new aspect of mental disease has been opened up to the physician who has been fortunate enough to have a fair amount of psychological training or an unusual share of common sense. This new opportunity has to do with the latest discoveries in the field of neurosis, which reaches out into the social and psychological problems of all mankind. To the medical man who has not seen the vision of a greater service than the limits of orthodox medicine and surgery, the picture is one of unbelievable magnitude. The newer problems and their solutions promise extraordinary rewards, not only to medicine, but also to society as a whole."*

*From one of Dr. Claude Wm. Chamberlain's Radio Talks.

Midwest Safety Conference

—A Review of Items of Interest to Industrial Physicians and Surgeons—

THE 13th Annual Midwest Safety Conference, under the auspices of the Chicago Safety Council, Illinois Industrial Commission, Keep Chicago Safe Committee, and Safety Section of the Association of American Railroads, was held at the Stevens Hotel, Chicago, Wednesday and Thursday, May 8-9, 1935.

This was one of the most successful of the Midwest Safety Conferences, there being delegates from many adjoining states and also many eastern representatives present. Sessions were held on various subjects: fire prevention; handling materials; safety equipment; first aid; industrial and community safety; training and education methods; commercial vehicles; and occupational diseases. There was an all-day session of the Safety Section of the Association of American Railroads with a special committee of railroad safety representatives in charge.

Occupational Diseases

OF SPECIAL interest was the Occupational Disease Session held on Thursday afternoon, May 9, at which DR. J. A. BRITTON spoke on "Occupational Health Hazards — Elimination and Control," and DR. M. N. NEWQUIST, of the American College of Surgeons, talked on "The Plant Medical Service and Occupational Health." The Safety Equipment Session, on Wednesday, May 8, also included a subject of considerable importance, "The Selection and Use of Approved Respiratory Protection Devices," by DR. E. G. MEITER, Director of Industrial Hygiene Laboratory, Employers Mutuals, Milwaukee, Wis.

DR. BRITTON said in part that the elimination or control of occupational disease hazards is a manufacturing problem; although the medical department has a part in this problem, it is mainly an engineering consideration. Adequate progress has not been made previously because of misunderstanding of responsibility. Life depends on industry, and this is an industrial age—hand work may now be considered mainly as diversion. Almost all industries have health hazards, many of which are insignificant, but many of which are serious. Any process may be hazardous at some time under certain circumstances. It has been accepted that the element of cost production should include the cost of accidental injuries; we may hear of the application of this same principle to health hazards. The incidence of accidental injuries compared with sickness in industry, shows a ratio of 1 to 10 respectively. But disease is less spectacular and less impressive, hence less emphasis is laid upon it. There has been great difficulty in arousing the proper authorities in regard to disease situations, even when the medical profession sees the problem clearly. Because of these facts, common health problems are considered urgent because of their cost. We may classify sickness as comprising those diseases which are common to all persons; those which are common to all but higher in industry; and those which are peculiar to industrial processes. The understanding of any health problem is no different from the understanding of any manufacturing problem. There has been little interest in the real development of scientific methods and in the special training of persons with regard to occupational disease.

Engineering problems are investigated thoroughly in industry—for example the investigation of defects in automobile axles—every effort is made to develop methods and means to clear up such defects, through the adaptation of intelligent engineering principles to such problems. We are beginning to think this way in health problems. It has been said that difficult things take time and that the so-called impossible things take more time.

In attacking this problem, a plan is first necessary in which the quality of personnel will play a very vital role; we must next know what constitutes a hazard, and then we can apply methods of control. The time is past when a medical service is limited to superficial examination and the rendering of first aid—such a service must also include knowledge of jobs. The physician in industry must be honest with himself, with the employees, and with industry, and must be a friend of the workmen.

In the rendering of industrial medical service, there must be proper equipment for adequate diagnosis; industrial medical men must keep in touch with the literature; and there must be adequate provision for competent consultation.

Engineering and medical groups in industry must supplement each other; there must be an accurate knowledge of hazards and their effects. It should be possible for industrial engineers to consider health hazards as a first duty, and management should provide the time for the proper working out of these problems by the engineers —this in addition to problems of production.

Another important point is that the employees should be properly organized, as in accident prevention where the whole system permeates from the head of the organization down to each individual employee. There is no reason why such a system should not work equally well in health problems. A persistent educational program among employees is necessary, and there should be periodic inspections throughout industry for occupational disease hazards.

Knowledge of occupational diseases is unfortunately limited to a few persons and industries—that is to say any adequate knowledge. Dr. Britton was convinced that no occupational disease exists that cannot either be prevented or controlled to a considerable degree. Fortunately such control or prevention does not increase the cost of the product or decrease the value of the product. As an example, a change from dry to wet grinding was cited, it being possible through the change of process to manufacture a greatly improved product and also to decrease the cost of manufacturing.

In summary, the elimination and control of occupational disease hazards depends upon (1) complete knowledge by plant physicians of the effects of such hazards on all employees in all processes; (2) a thorough understanding of the processes that produce or may produce injury to the health; (3) a thorough knowledge of protective methods; and (4) a comprehensive educational program in the "Safety First" of occupational diseases.

DR. NEWQUIST called attention to the preliminary surveys of industrial medical service begun by the American College of Surgeons in 1926, and the continuance of this work up to the present time. He also showed a large number of lantern slides giving statistics regarding working conditions and accident rates. Among other facts which were brought out were these: there are approximately 49,000,000 persons over the age of 10 employed in industry according to present records; statistics considering the seven most frequent causes of death from disease and accidents; the frequency and severity rates of accidents showing a decrease, of which Dr. Newquist said that one-third of the decrease can be assigned to medical service in industry.

The objectives of industrial medical service were summarized as being: (1) determination of the physical and mental fitness of employees applying for work; (2) health supervision; (3) cooperation in accident prevention and hygiene programs; and (4) the reduction of absenteeism, especially as to time lost on account of sickness.

All this does not mean that industry should practice medicine, but that there should be in industrial medical service a sound application of human and business principles, through the following procedures: (1) pre-employment and periodic examinations; (2) complete care of all injuries and occupational diseases; (3) sane first aid measures; (4) elimination of all accident and health hazards; and (5) the proper integration of industrial and private physicians.

One of the most important facts brought out by the surveys made by the American College of Surgeons from time to time is that the services of the so-called small plants were very inadequate. It is believed that the expansion of various groups of physicians who are now doing part-time work may greatly relieve this situation.

In considering the qualifications of the industrial physician, industry should know who he is, what he knows, and what he does. The American College of Surgeons has outlined what are thought to be the minimum requirements for a capable industrial physician and in part, these are as follows: (1) he should be a graduate of an approved medical school and licensed to practice in the state where he does his work; (2) should have at least one year internship in an approved hospital; (3) should have been in general practice and private work for a reasonable length of time, to form a proper background for his industrial work; (4) should be able properly to examine employees and determine their fitness for such employment; (it is believed that such examinations should be done only by physicians and further that eye examinations should also be done only by physicians—the defects of the eye are the ones which are most commonly met, which emphasizes the importance of properly controlling such defects and also interpreting the findings professionally); (5) should have a general knowledge of industrial relations, benefit plans, safety programs, and other similar industrial activities; (6) should know the types and nature of compounds used in manufacturing processes and their possible toxic effects; (7) should have a working knowledge of the diagnosis and treatment of occupational diseases; (8) should have an appreciation of and knowledge concerning sanitation and accident prevention methods; (9) should be competent to diagnose and secure proper treatment and consultation for traumatic lesions occurring in industry; (10) should be versed in follow-up and rehabilitation methods; (11) should be familiar with compensation laws, the keeping of adequate records and statistics, and should be able to render an annual report and summary of the experience of the medical department; and (12) should possess an unbiased industrial viewpoint and a confidence-inspiring personality.

In concluding, Dr. Newquist showed that medical costs in industry are somewhat greater than compensation costs at the present time, but are totally inadequate properly to secure the type of service which should be rendered.

Dr. Newquist then showed a motion picture on the emergency treatment of fractures, made by the American College of Surgeons at the Orthopedic Clinic of the Massachusetts General Hospital. This was essentially a demonstration of the proper use of the Thomas splint and modified Thomas splint in transporting injured persons to where they can get proper treatment.

DR. MEITER'S presentation on "The Selection and Use of Approved Respiratory Protection Devices," disclosed that the term "approved" related especially to the work of the U. S. Bureau of Mines and the testing of such devices.

There are four types of equipment which have been considered in the Bueau of Mines' testing activities relating to the use of this equipment: (1) the filter type of dust respirator; (2) gas masks; (3) hose masks; and (4) self-contained oxygen breathing apparatus. The uses of different types of equipment as noted are specific and one must know the conditions under which these devices will be used; it is very important to receive proper advice regarding the adequate use of this equipment, since there are many factors which determine efficiency, which must be considered.

A great deal of emphasis has been placed upon the use of dust respirators within the past five years. It should be remembered that respirators are not substitutes for good exhaust ventilation—the best method is to eliminate the dust at its source—but respirators can provide efficient protection in cases of intermittent exposure.

Until Schedule No. 21 was issued by the U. S. Bureau of Mines last fall there were no official specifications for the testing of this kind of equipment. Respirators were divided into four types: type A for protection against dusts of mechanical generation; type B, for use where there are fumes of metals; type C, for use against mists, sprays, and vapors; and type D, for combinations of the above. Various types of tests have been standardized by the U. S. Bureau of Mines, such as resistance to air flow, resistance to inhalation, and adaptation to

facial contour. The details can be secured by obtaining a copy of Schedule 21 from the Bureau.

There have been five respirators approved by the U. S. Bureau of Mines, for use in protecting against dusts of mechanical generation, the so-called type A respirator: The MSA Comfo; Willson Bag Respirator No. 300; Willson Bag Respirator No. 400; Pulmosan M15, and the Biever.

An important point in respirator construction is the provision for a large filtering area as opposed to increasing the thickness of the filter, which naturally increases breathing resistance.

It must not be concluded that the problem is solved because we have approved respirators. The worker must be instructed in the use of the respirator and must be properly fitted individually. Provision must also be made for the proper cleaning and storage facilities of these devices, and the repair and upkeep of filter material — in other words, there must be continuous maintenance.

In considering gas masks, it must be borne in mind that the filter type of respirator gives no protection against the hazards where gas masks should be properly used. The gas mask is really a chemical filter, very often used with special canisters, which take the injurious material out of the air; however, no oxygen is provided, and in cases where there may be oxygen deficiency, the gas mask is not to be considered as adequate protection. In this connection, a demonstration was given of the flame safety lamp which is used in mines, and which goes out at approximately a concentration of 17% of oxygen, allowing a safety margin, since the gas mask must not be used in places where there is less than 14% oxygen or where there are injurious vapors which are present in concentrations above 2% to 3%.

In supplying canisters for the use of gas masks, a code has been worked out showing the various types of canisters which protect against specific gases, each being designated by a special color, and certain combinations also being designated by special color arrangements. In general, protection can be afforded against carbon monoxide, acid gases, ammonia, petroleum and other vapors, and smoke. Approval has also been made by the Bureau of Mines of various types of gas masks, the complete list of approved devices being available through the Bureau.

Considering hose masks, such devices are to be used where it is necessary to provide a continuous supply of fresh air to the industrial employee. Such hose masks should be used with a lift belt and line, because in case of emergency it is not well to rely on the hose being able to lift the weight of a man, although tests are made for this purpose. There should be two attendants outside the gas area, so that the man may be lifted out at any time when an emergency occurs. The maximum length of hose approved by the U.S. Bueau of Mines is 150 ft. The blower which supplies the fresh air, should always be outside the contaminated area, for obvious reasons.

In discussing the fourth type of respiratory protective devices, the oxygen breathing apparatus, it was stated that this was used mainly in mines and in mine rescue work. The principle of this device is to absorb the carbon dioxide created by the human body and allow the nitrogen and oxygen to be rebreathed. This type of apparatus is used in places where it is necessary to be assured of an oxygen supply which will sustain life and activity. An approval list of self-contained oxygen breathing apparatus has also been issued by the U. S. Bureau of Mines.

Equipment Exhibit

A FEATURE of this year's Midwest Safety Conference was an extensive exhibit of protective equipment, a great many of the details of which will be interesting to industrial physicians and surgeons. A brief list of the exhibitors, with some of the principal products shown, is as follows:

AMERICAN LA FRANCE FOAMITE INDUSTRIES, INC.: Canister gas masks, anti-freeze fire extinguishers, generator systems, and automatic fire extinguishing systems.

AMERICAN OPTICAL COMPANY: Various types of goggles and helmets.

BROWN SHOE COMPANY: All-purpose safety shoes and shoe caps.

E. D. BULLARD COMPANY: H & T safety slides, various first aid equipment and materials, especially for first aid treatment of snake bite.

R. H. BUHRKE COMPANY: Safety belts and buckets.

CHICAGO EYE SHIELD COMPANY: Respirators, masks, helmets, and goggles.

DAVIS EMERGENCY EQUIPMENT CO., INC.: Gas masks, first aid kits and supplies, airline masks, inhalators, linemen's safety equipment, Isodine and Tannoid.

DUKE LABORATORIES, INC.: Elastoplast, Aquaphor, Nivea Cream and Lotion.

HOLCOMB SAFETY GARMENT COMPANY: Including leggings, coats, aprons, and gloves.

HYNSON, WESTCOTT AND DUNNING, INC.: Various mercurochrome products, and Thantis Lozenges.

INTERNATIONAL SHOE COMPANY: Safety shoes.

JUSTRITE MANUFACTURING COMPANY: Safety cans and containers, electric mine car trip lamp.

WALTER KIDDE & COMPANY: Fire extinguishers, and systems of various types.

LEHIGH SAFETY SHOE COMPANY, INC.: Varieties of safety shoes.

MINE SAFETY APPLIANCES COMPANY: Gas masks and canisters, hose masks, respirators, goggles, half masks, special Comfo respirator and dust hood, All-Service gas mask, combustible gas indicator, and carbon monoxide indicators, alarms, and recorders.

THE PATENT SCAFFOLDING COMPANY: Scaffolding, ladders, platforms.

PROTECTIVE EQUIPMENT, INC.: Goggles, respirators, helmets, handshields, ladders, scaffolding.

PROTECTOSEAL COMPANY: Containers and units for handling and storing of hazardous liquids.

PYRENE MANUFACTURING COMPANY: Fire extinguishers, accumulators, accessories.

SAFETY EQUIPMENT SERVICE COMPANY: Shields, helmets, hoods, respirators, gas masks, leggings, gloves, goggles.

SAFETY FIRST SHOE COMPANY: Safety shoes.

STANDARD SAFETY EQUIPMENT COMPANY: Goggles, safety shoes, respirators, masks, safety washers.

SHEPHERD SAFETY SHOE CORP.: Safety shoes.

WILLIAMS JEWELRY & MANUFACTURING CO.: Trophies, emblems, badges, buttons, commemorative jewelry.

Measures of Dust Control

—*And the Importance of Properly Conducted Physical Examinations in Determining Their Effectiveness*—

by

W. J. McConnell, M.D.,*
Assistant Medical Director
Metropolitan Life Insurance Company

DUST as the responsible cause, real or alleged, of certain intoxications and diseases has prompted a great deal of discussion recently regarding what dusts are harmful and what measures are effective in protecting exposed workers.

Few indeed are the industrial processes in which dust is not given off, and seldom do we find in the air of a plant environment dust of a single element but, rather, we encounter a mixture of dusts whose physical and chemical natures determine their harmfulness.

Dusts in the air, of a character to injure the body when inhaled and in sufficient quantities, act in a variety of ways. Certain dusts are soluble or slightly soluble in the body fluids, and their harmful effects are proportional to the toxicity of the compounds formed. Examples of such poisonous dusts are lead, mercury, and arsenic. There are dusts which exert their harmful effect locally on the skin and mucous membranes and through irritation of the respiratory passages. Chromic acid and alkalies are examples. Other dusts are insoluble or very difficultly soluble in the body fluids, and their inhalation may induce pathological changes in the lungs and other serious consequences.

The dusts which fall within this latter classification may be subdivided into non-fibrosis and fibrosis-producing dusts. (By fibrosis is meant the replacement of the normal elastic lung tissue by an unyielding scar or fibrous tissue). The non-fibrosis-producing dusts include chiefly the organic dusts, mainly the vegetable fibers, such as cotton, jute, hemp, etc. Their exact pathological effects have not been investigated to the fullest extent as yet.

The fibrosis-producing dusts are of particular interest at the present time because of the multitude of personal injury suits and claims in every section of the country growing out of industrial dust hazards and alleged diseases, and because of the conflicting testimony of those who specialize in the litigation field. All fibroses of the lungs caused by the inhalation of dust may be classified under the general term "pneumoconiosis," which means a dusted lung. Terms such as silicosis and asbestosis are descriptive of diseases caused by the inhalation of silica and asbestos dusts, respectively.

There is a convincing body of evidence which shows clinically, pathologically, and experimentally that the most injurious of the fibrosis-producing dusts is dust containing free silica, because exposure distinctly predisposes the individual to tuberculosis which, although it may supervene comparatively late in life, runs a rapidly fatal course. Quartz, flint, and sand are among the dusts high in free, uncombined crystalline silica which are most hazardous to human health. Sandstone and granite also cause lung fibroses, but as a rule only after a prolonged exposure.

With dusts containing combined silica only, there appears to be less serious damage to the lungs.

Some of these dusts set up an uncomplicated fibrosis and are deposited in the lungs in quite large quantities with comparatively little harmful results. Carbon, slate, cement, limestone, gypsum, and calcite are examples of dust of this character, and the question is not wholly settled with regard to the possible effects of all such dusts. Miller and Sayers have been conducting a series of experiments to determine the physiological response of the body tissue to dusts of various kinds, including the dusts just mentioned, by injecting the dust into the peritoneal cavity of experimental animals and they have classified the reactions into three types, namely, an absorption or dissolution of the dust, a proliferative reaction, and an inert reaction. The reaction is essentially the same microscopically as that produced in the lungs, and the gross appearances are sufficiently differentiated to permit of such classification.

There is evidence to show that asbestos dust, which is a hydrated magnesium silicate, causes a fairly typical fibrosis, which, while it does not apparently result in a terminal tuberculosis, may produce symptoms of dyspnoea and cough, and in some instances has been reported as a direct cause of death. Cement dust, which is composed largely of limestone and clay or shale, contains about 22% of total silica of which about 1% is in the form of free silica. A study conducted by the U. S. Public Health Service of a few plants of this industry indicate that although a mild type of fibrosis may develop in exposed workers, cement dust does not predispose to tuberculosis. This study, as well as other investigations of sickness among cement workers, has shown, however, that other respiratory diseases such as bronchitis occur with much greater frequency among these workers than in the general population.

Conclusive evidence of the degree of injury produced by marble and feldspar dusts is less than in the case of any of the other dusts, but both may be considered potentially harmful. Gardner has shown experimentally that marble dust, which contains practically no free silica, is largely soluble, and that although, after prolonged inhalation of marble dust, a certain amount of insoluble siliceous material accumulates in the lungs, it apparently produces no important reaction in the tissues of normal lungs. However, guinea pigs infected with tubercle bacilli of low virulence prior to marble dust exposure showed increased numbers of tubercles and increased calcification of the lungs, as compared with normal non-dusted, similarly infected, control animals.

Dr. Bianchi reported, at the International Conference on Silicosis in 1930, the results of a care-

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ful clinical and radiological examination of a group of 250 marble workers engaged in work in closed workrooms. In a number of cases, the skiagrams showed diffuse nodes of thickened tissue spread over most of the respiratory surface. Only slight functional alterations with symptoms of chronic bronchitis and pulmonary emphysema were apparent clinically.

The conclusion was that marble dust causes pathological lesions, characterized by diffuse foci of peribronchitis and interstitial pneumonia which can be observed in x-ray films of workers exposed for several years to the dust and which are accentuated in proportion to the length of time of exposure to marble dust. There were no significant functional disturbances observed.

Dr. Turano, in a statistical study of the death certificates of a group of marble workers, was unable to show any unduly high mortality rate from tuberculosis, but, on the other hand, there was no evidence that the marble dust had any benign effect on the course of tuberculosis, as sometimes claimed.

Feldspar dust usually contains silica combined with oxides of potash, soda, iron, lime, etc. It is frequently found in mixture with quartz. Some feldspar may be of low free silica content, however. Carleton, experimenting with guinea-pigs, exposed them to feldspar dust having the empirical formula $K_2O.Al_2O_3.6SiO_2$. The following results are quoted from his experiments:

"The lung changes produced by the inhalation of this dust at the standard concentration [the dusts were measured by volume and the total amount of dust placed in the machine for each period of two hours for 12 days was 135cc.] were slight up to one month after the last exposure, since they only comprised some proliferation and thickening of the alveolar epithelium. From two months onwards, plague-formation and areas of broncho-pneumonia are in evidence, although the amount of dust in the lungs undergoes some diminution. The last specimen examined (nine months after exposure) showed a mild fibrosis of the lung substance immediately surrounding the peribronchial and peri-vascular connective tissue."

The conclusion he draws is that feldspar, when inhaled, under the conditions of these experiments is a harmful dust. Like china clay, it produces but little initial reaction, though severe and permanent lesions subsequently follow. Even after the short exposure to which the guinea pigs were submitted, feldspar eventually produced a slight fibrosis as well as plague-formation. These experiments, he states, indicate that feldspar must be regarded as a dust which would probably prove harmful if inhaled by human beings.

In a study of quarry workers in the basalt quarries of New South Wales no evidence of tuberculosis was found in about 15 men examined who had been exposed to heavy concentrations of the dust in crusher houses of quarries where the metal extracted is said to be a dolerite containing 3% free silica and a basalt containing no free silica. One man, who had been engaged in the crusher house for 25 years and in quarries for 16 years previously, showed an early stage of fibrosis of the pneumoconiotic type. The authors were of the opinion that in order to produce fibrosis, exposure to the calcium and sodium feldspars had to be a prolonged one.

Talc is another dust which has been considered relatively harmless compared with the far more injurious dusts containing a high percentage of quartz; still it has been more or less well demonstrated that talc dust is capable of causing a very slow chronic inflammatory pneumoconiotic process in the lungs. Few such cases have been reported, but Dr. Cunningham, of the Ontario Department of Health, observed one case in a talc grinder in 1930 which led him to study a group of 32 rubber workers with moderate exposure to talc dust in 1932, with the result that no evidence of lung fibrosis was found except increased linear markings in some of the x-ray films. Two of these workers had active tuberculosis. In 1931, Dr. Zanelli, of the Milan Occupational Disease Clinic in Italy, reported a distinct case of talc pneumoconiosis with tuberculosis in a 27-year old woman who had been spraying talc into the inner tubes of bicycle tires with a compressed air jet during five years with no protection from the dust.

An extensive study of the effects of talc dust on the lungs of workers in mines, crushers, and mills was made by Dr. Dreessen, of the U. S. Public Health Service. This talc contained no free silica, and the silicate content was 56.54%. The dust exposures in the talc mines ran as high as 1440 million particles under 10 microns in diameter per cubic foot of air, and in mills and quarries from 52 million to four million particles. On clinical examination of 57 workers, very few signs of pneumoconiosis were found, though there was some bronchitis. On x-ray examination one case of moderately advanced pneumoconiosis with tuberculosis was found and 15 cases of early pneumoconiosis, one of which had tuberculosis. Of the negative group, 38 had more lung fibrosis than usual, 13 of them having tuberculosis, while three were entirely negative for pneumoconiosis, but of these two had tuberculosis.

While the cases studied were too few to permit definite conclusions, it was thought that the indications were that exposure to the talc dust encountered in this study does induce a fine, diffuse fibrosis demonstrable by x-ray and that even under fairly severe conditions of exposure of mostly between five and 10 years duration, the resultant pneumoconiosis had not caused disability.

There are other dusts and mixed dusts of various combinations of which we know very little regarding their physiological reactions. We have very little information regarding the effects of breathing air containing dust of wood fiber in saw mills, planing mills, and similar industries except that under habitual inhalation of wood-fiber particles a catarrhal affection of the respiratory passages with many disagreeable symptoms is set up. Some wood fibre contains alkaloids and ethereal oils, which produce an additional toxic effect. Asthma has been reported as resulting from the inhalation of mahogany, satin wood, sandalwood, and teals. A great need for research in this field exists, as well as careful correlations between exposure to dust and the resulting tissue changes.

In order to evaluate the health hazards existing in any working areas, it is essential to determine the source of origin of the dust, its concentration within the breathing zone of workers, its chemical composition, and in most instances, the size measurements of the particles.

METHODS of collecting air samples and the technique for determining counts have become more or less standardized, but training and experience are required for accurate results. The impinger method, based on studies of the U. S. Public Health Service and the U. S. Bureau of Mines, has been selected on account of its efficiency and because it permits taking large samples of air. The impinger collects the samples by aspirating the air at the rate of one cubic foot per minute through a dimensioned glass tube tapered to an orifice of a given diameter and impinging it onto a flat surface which is at right angles to, and at a specified distance from, the orifice. The impinger tube is fitted into a suitable container, usually an Erlenmeyer flask containing the entrapping liquid. The impinger is actuated by suction, and the rate of air flow during sampling is measured by means of a small vacuum gauge inserted into the suction line. The sample should be taken within the breathing zone of the worker. Wherever masks or respirators are worn by the workmen, a connection is made either into or under the helmet by means of rubber tubing which is connected to the impinger. Each sample collected by the impinger method should represent a sample of dust from a volume of air amounting to from 50 to 100 cubic feet. After collection the sample is made up to a definite volume suitable for counting, and a portion is removed to a Sedgwick Rafter counting cell for microscopic count to determine the number of particles present. In addition to the enumeration of the particles, a sample of the dust is chemically analyzed and the particulate matter is measured for size distribution. The results are expressed in terms of the number of particles under 10 microns in greatest diameter per cubic foot of air and of a specified chemical composition. The larger particles are not considered of significance, as only the smaller particles, usually those under five microns, reach the terminal lung passages.

With this information and a knowledge of the length of the exposure of the worker in terms of years, the seriousness of the hazard can be fairly well estimated, provided the physiological effects of the dust or combination of dusts are known.

THE effective methods of dust control depend upon the circumstances giving rise to the dust in each individual process. There is no single measure applicable to all dusty operations. A combination of measures usually must be employed to insure success.

In general, preventive methods include the substitution of harmless or less harmful substances for harmful ones; the segregation of dust-producing operations; enclosure of dusty processes; local exhaust ventilation and increased general ventilation; wet methods for dry; protective devices; good housekeeping; shop education; and medical supervision.

Segregation of dusty operations usually can be done without loss in efficiency, thus limiting the exposure to a minimum number of workers. Those engaged in non-dusty operations, and even office employees, are often needlessly exposed to dust, owing to failure to isolate dusty processes.

The preferred method of dust control, wherever it is at all feasible, is to entrap the dust at its source of origin by localized exhaust and dispose of it in such a manner as to prevent its dispersion. To effectively exhaust dusts is easier said than done. The object of exhaust ventilation is not to create "suction", but to produce air currents at the point of dust generation of the proper magnitude and direction so as to destroy the energy of the escaping dust and force it into the exhaust system. An efficient exhaust produces adequate air velocities in the area of dust production and minimum air flow from the dustfree areas with minimum power consumption. It is obvious, therefore, that technical knowledge of the laws governing the flow of air and of the way in which the dust is produced, especially with respect to size and speed with which particles are thrown off, is essential. Dust exhaust systems, however efficient when first installed, may be rendered more or less useless by mechanical defects that develop unless they are kept in good repair. Intelligent supervision is necessary. The effectiveness of dust control equipment should be determined from time to time by dust counts.

Increased general ventilation may be used to advantage under circumstances where local ventilation is not practicable. The passage of large quantities of air through the working areas diminishes the dust content by dilution. Care should be taken, however, not to employ air velocities so great as to create drafts.

The free use of water as a dust control medium can be and has been applied successfully under proper supervision in certain operations, particularly in mine drilling and in wetting down walls, floors, and muck piles. It has been demonstrated recently that dry drilling, also, can be safely performed by attaching a dust trap to the drill.

The use of chemicals known to prevent dust dispersion is another possible method of dust control which may prove successful under certain conditions.

Where it is impracticable or impossible to control dust at or near its source of origin, our only recourse lies in protecting the exposed worker by insisting that he wear a protective device. Personal protective devices are of two kinds: (1) the positive pressure respirator which provides to the wearer air from a clean source of supply, and (2) the filter respirator which, by means of a filtering medium, excludes varying amounts of the dust. The former gives by far the best protection, but is limited in its application. Respirators are more apt to be worn when the worker is exposed to dusty processes for only short periods of time. Naturally, if these devices are expected to function properly, it is important to keep them in good repair and change the filtering medium as often as it is found necessary.

The installation of equipment for controlling harmful dust is of doubtful value if previous accumulations of dust are not removed. Orderliness and cleanliness, in so far as it is practicable for the type of work conducted, are obvious factors in dust control. Cleaning by vacuum usually is practicable and preferable. A responsible person should be assigned the task of supervising housekeeping. Elimination of bad shop practices is best accomplished by instructing workers regarding the dangers incident to their occupations. The employee who understands the reason for employing protective methods and devices will in most instances cooperate with the management.

THE effectiveness of dust control measures in preventing diseases produced by dusts can be determined only by careful physical examinations of the workers so exposed under the guidance of competent medical supervision. Laboratory, x-ray examinations, and other diagnostic aids must be included when indicated. Diagnosis is based on a correlation of the patient's occupation (present and past), his symptoms, and the clinical and physical findings. In the event of exposure to dusts which produce fibroses, the x-ray is a graphic means of recording the changes that take place in the lungs, although it lends itself to great abuse as frequently anomalies of the various anatomic structures are interpreted by the inexperienced as real abnormalities. It is important to acquire a technique of taking roentgenograms which will best show early changes, and special training is necessary, as well as considerable experience, before judgment is attained in the interpretation of such films. Dr. Sampson, of the Trudeau Sanatorium, has directed attention to some of the factors which, if neglected, will make interpretation more difficult. Probably the most important, he points out, is the blur due to screen-film contact and movement. The movement of the pulmonary markings at the left base due to the heart beat may well be mistaken for the cloudiness expected in early silicosis. Similarly, he states, the shadow of the margin of the pectoralis muscle is not unlike that shadow seen in cases of beginning fibrosis, and roentgenograms in which there is loss of detail due to movement, or large focal spot, or short tube-film distance, or a too contrasty film, or a combination of these may have such a shadow complex as to be mistaken for such pathological changes as take place before obvious nodulation has appeared.

The benefits which accrue to the employer and employee, alike, as a result of the physical examinations of all applicants for employment, as well as periodical examinations of those already engaged fully justify their inclusion in any program of dust control. Such a procedure protects the employer from engaging an applicant already physically or mentally impaired, who, later, may claim disability for a condition either not associated with employment or contracted during a previous employment. The examination establishes the applicant's physical and mental condition, and by keeping records of his subsequent illnesses and accidents, the question of responsibility for injury incurred during employment need never arise.

The applicant is protected from engaging in work for which he is physically ill-adapted and which, if undertaken, might easily bring about serious impairment of his health; whereas, if he is assigned to a job that involves no further risk to his health, he might be expected to continue for years as a useful and productive workman. The examination of applicants for employment likewise protects those who are already employed from the risks of communicable diseases being introduced into their midst by a new applicant.

Many of the younger individuals who seek employment have never before been subjected to a thorough physical examination and, consequently, are unaware of the defects from which they suffer. As a result of physical examinations, many defects are located which may be removed or corrected before they have caused irreparable damage, thereby increasing the efficiency of the worker and often averting definite and finally chronic diseases.

Of even more importance than the initial physical examination of applicants is the periodic examination which serves to check the adequacy of preventive equipment designed to entrap harmful substances from escaping into the breathing atmosphere. The periodical physical examinations of workers offer the most effective means of controlling the health of large groups of individuals by discovering early not only occupational diseases, but also many other conditions that go undiscovered until the worker is acutely ill or becomes disabled. They afford the medical supervisor the opportunity to make certain that employees are engaged in suitable work out of which they are getting maximum results; they enable him to correct the effects of undue exposure to injurious environmental conditions, and, generally, to lessen all occupational hazards. As a public health measure, it is impossible to over-estimate the value of these examinations in establishing among employees interest in sickness prevention.

Any number of instances of adequate medical supervision of workers might be listed, differing from one another in certain respects, but all retaining the essential features of control measures. Briefly, these include:

1. The establishment of a medical department with adequate facilities and medical personnel qualified in the field of industrial medicine.

2. The routine examination of all applicants for employment. This should include an x-ray of the chest of those who will be exposed to dusty processes.

3. The rating and placement of applicants. In cooperation with the personnel department, each applicant should be rated and placed, not only on his training and past experiences, but also on his physical and mental abilities to fill vacancies occurring from time to time.

4. Periodical physical examinations. The frequency of periodical examinations necessarily must depend upon individual circumstances according to the need for such examinations and other diagnostic procedures as determined by the supervising physician.

5. Provision for the disabled. Employees who develop disabilities during the course of employment should be re-assigned to occupations which will not interfere with or aggravate the disability, or they should be provided for in other ways. Employees want, above all else, security of employment. Physical disabilities need not disqualify a man for work, but, rather, indicate the type of work he can do and not endanger himself or others, thereby prolonging his years of usefulness and adding to his enjoyment of life.

For a long time the importance of accident prevention has been well recognized by industry. The very earliest attempts at industrial medicine consisted largely in the prevention and treatment of accidents occurring in the course of employment. By systematic work along educational lines and establishment of safety departments supervised by trained personnel, the occurrence of serious accidents, many of which were considered as unavoidable, has been enormously reduced. The control measures here enumerated

are intended to bring about a like reduction in diseases, particularly those associated with or initiated by the so-called hazardous occupations.

A program of dust prevention, as an economical procedure, should be given careful consideration in view of the present-day inclination on the part of legislative bodies to revise the compensation acts or pass new ones to include coverage on occupational diseases. Provision for the inclusion of occupational diseases appears to act to the best interest of employer and employee, alike, and avoids the unpleasantness of civil suits which are costly and time-consuming, to say the least. Expert advice, however, must be supplied to those engaged in drafting legislation for compensation of occupational diseases to insure fairness to all concerned. The question as to what is and what is not an occupational disease and whether a claimant is suffering from an occupational disease due to the nature of and arising out of his employment requires expert scientific determination. An essential feature in the proper administration of an occupational disease act is the provision for the appointment of a board whose membership consists of individuals possessing special medical and chemical knowledge. Disputed cases should be referred to this board, whose findings, after coordinating the medical, radiological, and pathological examinations, as well as the results of scientific investigations, should be regarded as conclusive in the field of the special knowledge.

In the United States, the State of North Carolina is the only state, so far as I am aware, that has provided for such an advisory board. The Amendment to the North Carolina Compensation Act Covering Occupational Diseases adopted by the General Assembly, March 26, 1935*, lists the occupational diseases encountered in the industries of the State and provides a means of determining the extent of disability incurred, which seems to be in fairness to all concerned.

First Aid and Its Relation to Accident Prevention

By LEVERETT D. BRISTOL, M.D., DR. P. H.,**
Health Director,
American Telephone and Telegraph Company,
New York

FIRST AID is defined by the American Red Cross as "the immediate temporary treatment given in a case of accident or sudden illness before the services of a physician can be secured."

The St. John Ambulance Association of Great Britain has defined first aid as "a special branch of practical medicine and surgery, by a knowledge of which trained persons are enabled to afford skilled assistance in cases of accident and sudden illness, and through which prolonged or permanent disability may be prevented and life often saved."

First aid and accident prevention constitute the best cooperative team by which accidental injuries and their results in disability, suffering and death may be conquered. First aid is, in fact, the most important adjunct of accident prevention.

While first aid means much more than the prevention of infection, it may truthfully be said that what early diagnosis and early medical treatment have been to the control of tuberculosis and cancer, which are now looked upon as preventable and curable diseases if taken in time—first aid has been to the prevention and control of infections following accidental injuries; what Lister of England did for surgery in the prevention of infection following surgical operations — first aid will do in the prevention of potential complicating infections following accidents and injuries; what Oliver Wendell Holmes and Semmelweis did for the prevention of infection of the mother at the time of the birth of her child—first aid will do in cutting down the incidence of infection and blood poisoning following accidental injuries. Moreover, first aid study and practice promote safety-mindedness or safety consciousness. To *think* safety should be the ultimate goal of all accident prevention work.

The Safety Program

THE relation of first aid to accident prevention possibly may be brought out by considering an outline of the safety program as a whole and endeavoring to measure relative values of each element in such a program with particular reference to first aid. The writer[1] recently developed a measuring yardstick, or appraisal form, which may be used in this connection. Such a plan (as outlined in Table 1) presents a complete program of essential industrial safety activities, and through a scoring method makes it possible to bring out the strong and weak spots in any particular program. It also presents a chart to guide a company's activities in the safety field, and makes possible a rating or scoring against ideal assigned values and indicates how thoroughly these activities are being administered. Other advantages in such a plan are that it supplies relative values of various activities, and sets up standard units of measurement by which progress of the safety program from year to year may be followed; it is an additional check on the end results of safety work, and if the end results such as the number of accidents are not what they should be, this plan may indicate whether the program or the responsible individual is at fault. If an industrial safety program is not working right, the record of accidents soon tells the story—but does not tell why. Such a device should aid in locating strong and weak points in the program. Finally, such a plan should stimulate a keener interest in the safety program through the entire personnel of an organization, and also may serve to integrate the safety program with the whole industrial health program, and the latter with the complete personnel and industrial relations service of a company.

By referring to Table 1 it may be noted that in the entire program of safety activities the value of first aid must be considered potentially as making up nearly one-quarter of the total value of the whole accident prevention service. Thus out of a maximum total score for a more or less ideal and complete safety service for larger companies, first aid would score a maximum of 20 under section C-2; 10 under section E-3; at least 10 under section A; and 5 under section B-4; or 45 out of the maxi-

*See *Industrial Medicine* for March 1935, p. 149, for the full text of this law.

**Paper presented at the North Carolina Safety Conference, (Public Utilities Section), Durham, N. C., May 9, 1935.

1. BRISTOL, L. D.: Measuring the Industrial Safety Program, *Personnel Journal*, Vol. 13, No. 4, December, 1934.

mum total of 200. It should be emphasized that these proposed relative values are preliminary and tentative and subject to revision on the basis of group judgment.

Reference is not made in Table 1 to such important activities and facilities as pre-employment physical examinations, selection of employees, illumination, ventilation, sanitation and rehabilitation, because these and others that might be listed are factors related to the entire health or personnel program and are included in the writer's[2] more general appraisal forms developed a few years ago. A committee of the American Public Health Association, of which the writer is chairman, eventually will attempt to standardize an official form for the appraisal of the entire industrial health and safety program.

Elements and Principles of First Aid Service

WITHOUT elaborating on the details which are more or less self-evident, the following may be listed as an outline of the fundamental elements of an adequate first aid service:

A. *First Aid Treatment*
   1. Immediate reporting of injuries for diagnosis and treatment, together with complete records of same.
   2. Conveniently located first aid treatment facilities.
   3. First aid work carried on under trained and experienced personnel.
   4. Follow-up of each case on the job and at home if necessary.

B. *First Aid Instruction*
   1. Instruction of foremen and supervisors on principles and practice of emergency first aid, including particularly artificial respiration and the control of bleeding.
   2. House organ publicity, shop and office talks, moving and talking pictures and bulletins on the subject of first aid.
   3. First aid training classes, teams and contests, when practicable and feasible.
   4. First aid committees and special campaigns and rallies to stimulate group interest.

The five general principles to be applied as they may be necessary in the practice or teaching of first aid work are:

1. Obtaining a doctor's services
2. Stopping bleeding
3. Restoring breathing
4. Making the patient as comfortable as practicable
5. Doing no more than what is actually needed.

Accidents and First Aid in Public Utilities

AS IS the case in many other industries, the three important causes of accidents in the public utility industries are: (1) lack of proper supervision; (2) lack of individual care; and (3) lack of safe physical conditions of surroundings and equipment. While the *frequency* rate of accidental injuries in public utility companies usually is below the average of all industries taken together, the *severity* rate has continued somewhat above the average of all industries in the U.S.

Recent studies of accidents in the public utility field indicate that they are due to conditions which apply more or less to all industries. This points to the fact that first aid and safety work in the public utility industries must be developed along much the same lines as for industries in general. The additional hazards of the public utility industries naturally are those which involve electric contacts and gas asphyxiation, suggesting that in the field of first aid in public utility industries there is no subject which is more important than that dealing with shock and the need for artificial respiration.

According to studies heretofore made, out of every 100 accidents in electric companies: 25 persons will suffer injuries through the handling of objects; 12 will be hit by flying objects; 11 will be hurt with tools; 10 will be burned, 6 of these due to contacts with electric currents; 9 will be injured by striking objects; 6 will be hurt by stepping on objects; 5 will be hit by falling material; 3 will be injured through the operation of machines; and 2 will have been bitten by animals or insects. Accidents due to burns and falls are the chief causes of lost time. On the other hand, out of every 100 accidents in gas companies: handling material will cause 23 accidents; tools, 14; falls, 13; striking objects, 7; falling material, 7; burns, 6; stepping on objects, 4; bites of animals or insects, 2; gas fumes, 1. Here again the chief causes of lost time will be falls and burns.

Special Opportunities of Public Utilities

PROPERLY trained employees of public utility companies have special opportunities to render first aid to the public as a real public service. In more senses than one these companies truly may be called Public Service Corporations. The chief objective of first aid work among employees naturally should be to make it possible for them to help themselves and their fellow workers in cases of accidental injuries; however, of almost equal importance are the possibilities of rendering first aid in their own families and to the public in general. The nature of public utility work, involving many employees who are constantly "on the go" driving on our public highways and entering the homes of our citizens for the purpose of installing equipment and maintaining service, is such as to afford many first aid opportunities, not the least of which may have to do with automobile accidents, fires and cases of submersion. Such relief to the injured is not only of the greatest value from a humane standpoint, but it may also constitute the finest possible contribution in the creation of good public relations on the part of public utility organizations.

Occupational Diseases

WHILE occupational diseases are relatively infrequent as compared with industrial accidents, there is a definite trend in several states toward the increasing of compensation coverage, with the inclusion of certain occupational diseases as well as accidental injuries. This naturally emphasizes the fact that all safety programs and first aid services must take into consideration the important occupational diseases, and it will be noted in Table 1 that the writer has included reference to these diseases in his proposed safety appraisal form. Because of the fact that occupational dis-

2. Bristol, L. D.: (a) An Appraisal Form for Industrial Health Service, *Amer. Jour. Pub. Health*, 1932, 22:1263. (b) Appraisal of Industrial Health Activities, *Industrial Medicine*, 1933, 2:85. (c) Industrial Health Service, Philadelphia, Lea & Febiger, 1933.

eases affect only a few of those exposed, are sometimes difficult to diagnose, vague in symptoms, slow in onset and frequently hard to treat successfully, first aid naturally has less of a place in dealing with these conditions than in cases of the more acute toxic conditions and accidental injuries.

As a rule, the work of public utility industries is not associated with any outstanding hazards so far as occupational diseases are concerned. Carbon monoxide poisoning, unless properly guarded against, occasionally may affect public utility workers in the manufacture or servicing of illuminating gas; in fire and boiler rooms; in company garages; and in various types of manhole and trench work. Lead poisoning is one of the hazards of working with lead pipes and cables, or in the reclaiming of lead junk. Naphtha and benzol poisoning may at times appear among public utility employees as a result of improper methods of painting, lacquering or cleaning operations. Gas works, tar and pitch and the long-continued handling of tarred poles and other tarred material occasionally may be the cause of various types of preventable acute and chronic skin disorders, the most serious of which may be a form of skin cancer.

Finally, it may be stated that with first aid as its first lieutenant, the ultimate object of safety work should be to make work safe for the worker and to make the worker safe for work, not only so far as accidental injuries are concerned but from all standpoints including the possibilities of occupational poisonings and diseases. Worthy and important as they may be, the bandaging of fingers or the prevention and control of dust diseases and industrial poisons should not constitute the ultimate goal or end of industrial hygiene and safety—they are only the beginning of a program. The chief health and safety problems in industry and the conditions which give rise to most of the disability, loss of time from work and financial cost, have to do with tuberculosis, heart disease, nervous and mental disorders, accidental injuries while *away* from work, and, most important of all, upper respiratory infections such as the common cold.

While industrial managements cannot be expected to take over the responsibilities of individuals, private doctors, or community health and safety authorities, there most certainly is an opportunity, if not a definite responsibility for industries to be interested in not only the so-called occupational diseases and accidents, but also in the non-industrial diseases and accidents *off* the job.

The practice of good health and safety habits on the part of employees, and the practice of good plant sanitation and safety on the part of management, should be objectives of prime importance in any and every program of industrial hygiene.

A. Records, Case Investigations and Reports	30
1. Complete investigation and report of each case of occupational disease, poisoning or accident	10
2. Records, giving name, address, occupation, date, cause, time lost and costs filed in a ledger book or card file	10
3. Essential facts of each case analyzed and correlated with information as to possible source, cause and future prevention	6
4. All cases reported to public authorities as required	4
B. Administration and Supervision	40
1. All executives participated in accident prevention program	10
2. Routine established to fix supervisory and employee responsibility	10
3. Safe methods of manufacturing or operating procedure continuously enforced and penalties applied when necessary	10
4. Safety practice motivated through supervisors' and employees' committees, meetings and rallies	10
C. Medical Examinations and Treatment	40
1. All employees exposed to special occupational hazards given a periodic medical examination	20
2. All employees who had occupational disease, poisoning or accident, brought immediately to professional attention for first aid treatment	20
D. Inspection and Protection	40
1. Regular periodic inspections of factories and shops made according to approved standards of sanitary practice to protect employees against occupational disease, poisonings and accidents	20
2. All necessary mechanical devices or guards in use for the environmental and personal protection of workers against injury	20
E. Education	40
1. All employees had instruction on accident prevention through bulletin boards, posters, talks and moving pictures	20
2. All employees exposed to particular occupational disease, accidents or poisonings had special instruction on the causes and methods of prevention of same	10
3. All employees had group instruction and practice on first aid and safety through special classes or contests	10
F. Laws and Regulations	10
1. All public laws and company safety rules and regulations complied with	10
Maximum Total Score	200

TABLE 1.
Sections, Subdivisions and Assigned Values of Proposed Appraisal Form for an Industrial Safety Service in Larger Industries

The Medical Department Manual

—The Complete Handbook of Organization, Operation and Routines Representing Actual Experience and Practice of 20 Years—

by

HART E. FISHER, M.D., F.A.C.S.
Chief Surgeon
Chicago Rapid Transit Co.

SECTIONS Published:

I. History of the Medical Department *(January,* 1934).
II. Physical Property;
III. Personnel *(February,* 1934).
IV. Functions and Routines;
V. The Centralized Medical Department;
VI. Subjective and Objective Relations;
VII. Research *(March,* 1934).
VIII. Forms *(April,* 1934).
IX. General Instructions to Examining Surgeons;
X. Classifications of Physical Defects;
XI. Classifications for the Reviewing Surgeon *(May,* 1934).
XII. Regulations and Requirements Governing Physical Examinations;
XIII. Interpretation of Physical Defects of Employees for Department Executives *(June,* 1934).
XIV. Requirements of a Course in Industrial Medicine and Surgery (*February,* 1935).
XV. First Aid in Industry *(March,* 1935).
XVI. Sanitation in Industry *(April,* 1935).

Sections in This Issue:

XVII. The Nurse in Industry.

Sections in Subsequent Issues:

XVIII. Industrial Medicine and Surgery; Its Past and Present Status.
XIX. How the Medical Department Can Be a Factor in the Reduction of Absenteeism.

XVII. The Nurse in Industry

THE NURSING profession in industry today, like industrial medicine and surgery, is in its infancy. Its future possibilities are unlimited, depending upon the cooperation of the medical profession and the large industries of the country.

The nurse who enters industry today must forget the so-called ethics of private nursing and adapt herself to an entirely new environment, which calls for the greatest diplomacy and tact. She must come into industry with the spirit of willingness to serve mankind. Pseudo-professional dignity in her contact with employees will soon be pierced by their observation; if she is to make a success of her profession, she must forget class barriers, which are so prevalent in private nursing, and conduct herself in a manner that will gain the confidence and respect of employees and employer. She must be willing to learn new things which were not taught where she secured her R.N., and be able efficiently to meet almost any condition that may arise. Unselfishness with her time and ability to make friends are factors that will aid her in becoming successful. In private practice there is very little possibility of a nurse's shortcomings becoming known to her patients, but in industry she is a member of a large family, so to speak, and her actions and mistakes become common knowledge among the employees. She should so conduct herself as to allow no occasion for idle gossip and criticism, which has been the cause of the downfall of many an otherwise capable nurse.

Loyalty to employees and employer, cooperation with the doctors and the management, and neatness in appearance are the cardinal qualities the nurse in industry should posses.

The duties of a nurse in industry depend upon the general medical policy of the industry wherein she is employed. First, there is the visiting nurse, or "sunshine aid," as I am prone to call her—for that is what she can become if by her willingness to serve she gains the confidence and love of the employees. Her visits to sick and injured employees are for the purpose of rendering service and giving cheer, and not of spying and carrying tales to officials of the company or other employees. When poverty or want exists in a patient's home, it is her duty so to advise the chief surgeon to the end that assistance may be forthcoming. The word "welfare" has done immeasurable harm in industry, as employees are quick to resent anything that smacks of charity. If employees are made to understand that your visiting nurse is different from the nurses of welfare and charitable organizations, their attitude towards her will be that of respect and not disfavor. Conditions in employees' homes should be kept in strictest confidence by the visiting nurse, her findings being reported only to the chief surgeon or medical authority of the industry.

If medical or hospital attention is necessary, the nurse should secure that attention immediately.

She should not hesitate to render service cheerfully to even the poorest, which will not reflect on her dignity but will improve her standing in the eyes of her fellow beings.

The question has often been asked of me by employers as to whether or not the visiting nurse should be uniformed. The main advantage of the uniform, to my mind, is that it offers a certain amount of protection from affront by the rowdy element about a city. However, the disadvantage of it is that many people, from their contact with nurses from charitable agencies and public organizations, resent the intrusion of a uniformed nurse into their homes, and will refuse to answer the door. Also, after some wear the uniform appears shoddy and the necessary neatness is lacking. I believe that a neatly clad nurse carries with her the necessary dignity and refinement, and makes a better impression on her patients than does one who is dressed in a uniform which carries with it an austerity that is unbecoming to a nurse in the field.

Another question that comes up is that of employing the services of nursing agencies for nurse work in industry. This, however, can be dismissed with the assertion that when you call in an outside organization to do your visiting nurse work, you bring in an agency that is not acquainted with the conditions and practices of your industry. These nurses do not make the personal contact with employees that is desired in time of illness, and, too, employees look upon them as outsiders and object to their services. Furthermore, with the work being done through an intermediate agency, there is always delay in reporting calls and circumstances that should receive prompt attention. These statements will be challenged by some of the nursing agencies, but from my personal experience I know whereof I speak.

There are so very many various agencies and organizations sending nurses into people's homes today under one pretense or another that it is beginning to wear on the patience of the average person.

The nurse's greatest activity is found in the offices of the Medical Department, where there are many positions she can fill that offer opportunity for promotion to better and higher-paid positions. In the reception room of the department a pleasant-appearing, neatly-uniformed nurse makes a favorable impression on prospective patients. She should be able to meet them tactfully and put them at ease. Her work is to make out employees' record cards and assign patients to the doctors in the department.

There should be one surgical nurse to every four doctors in the department; her duties consist in removing clothing from patients, preparing them for various examinations, sterilizing instruments and supplies, assisting the surgeon in treating injuries and the physician in making examinations, etc.

When a women patient is being examined or treated by a male doctor, a nurse should always be present to insure against any gossip that might otherwise develop.

There is a tendency in certain fields of industry to employ a nurse in place of a doctor to remove foreign bodies from the eye, put on dressings, prescribe medicines, etc. I wish to add a note of warning against this practice, for no matter how capable the nurse is, it is unfair to her, and some day it may result in embarrassment to the industry either financially or by affecting its prestige.

In physical therapy work, it is necessary to have a nurse who is thoroughly familiar with all the forms of electrotherapeutics, massage, diathermy and heliotherapy. She must know how to operate the various instruments, how to apply them for treatment, how long a treatment should be given, and how frequently treatments are necessary. She should watch the condition of the patient, and call the doctor's attention to any change.

The nurse must never leave the room while an apparatus is being applied to a patient.

In the x-ray department, if the amount of work does not warrant employing a physician, a nurse well-trained in x-ray and fluoroscopic technique and dark-room procedure can properly handle it. The actual interpretation of the films and fluoroscopic examinations must of necessity be done by a competent physician. In order to keep abreast of this specialty, the technician should be given the opportunity to take a postgraduate course.

The technician in our department has taken a course of instruction in two of the leading laboratories in Chicago.

All records and files of this department are in charge of the nurse, and her work should not be directed by physicians who are not thoroughly familiar with roentgenographic and fluoroscopic technique.

In the laboratory for diagnosis is the field where the trained nurse becomes a valuable technician. She should do the routine work, such as urine analyses, blood examinations, chemistry and Wassermann tests, and should be able to make bacteriological tests and determine tissue for diagnosis. Her findings should be checked for accuracy by an outside agency occasionally.

The trained nurse can arrange for and administer the test for metabolism after she has learned how to operate the apparatus and make her readings. She must be able to secure the confidence of the patient, who is generally in a very nervous state, if such a test is essential for diagnosis; and the accuracy of the test depends a great deal upon her ability.

The compensation of nurses in industry should be sufficient to allow them to enjoy the benefits of a good living and have hopes of bettering themselves in the industry in which they are employed. The nature of their work and length of time in service should be taken into consideration in determining their compensation. They should be urged to affiliate with a nurses' society and take an active part in its work, and in order to become better acquainted in their own company, they should cultivate the acquaintance of women employees and attend all company functions when possible. If more than one nurse is employed in a department, it is best to appoint one as supervisor or chief nurse, who should be responsible for the other nurses and the performance of their duties.

She should select those who are to aid her and be allowed to direct them in their work, but no favoritism can be shown if working harmony is to prevail.

One question that has been very frequently asked of me by both employers and heads of medical departments is: "Is it better to employ nurses who are recommended as capable, industrial nurses, or secure recent graduates and train them in the company's medical policy?" My personal experience is that I have better results in employing nurses who were engaged in private practice and training them in the work they were to do.

In the case of the trained industrial nurse, all industrial medical policies differ in certain respects, and it would be necessary for her to forget the routine learned in the previous position and learn the new method. In many instances I have found that nurses sent to me with lengthy recommendations did not even have the fundamentals of industrial work, the same as doctors applying for positions as experienced industrial medical and surgical men. Their training was very meager.

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EDITORS:
VOLNEY S. CHENEY, M.D., F.A.C.S.
HART E. FISHER, M.D., F.A.C.S.
OTTO P. GEIER, M.D.
LEROY P. KUHN, M.D., F.A.C.S.
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CHARLES D. SQUIRES, M.D.

CONSULTANT:
C. O. SAPPINGTON, M.D., DR.P.H.

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New York's Compensation Law Amendments

NEW YORK'S compensation law amendment, which becomes effective July 1, 1935 (see p. 272) is described in labor publications as accomplishing "the abolition of abuses in medical practice and treatment in compensation cases and providing for free selection of competent doctors." This amendment and the one referred to as "adding all occupational disease disability and death to the law as compensable" are among the "epochal improvements" in social security with which the legislative session just adjourned (April 17) is credited.

For quite some time the matter of the selection of physicians has been one of controversy between the medical profession and the insurance carriers. Among the reasons for this is the relation of the profession, as a whole, to the compensation acts, the unsatisfactoriness of the relation being "one of the most obvious things about the operation of the acts."[1]

The industrial physicians and surgeons were probably not altogether indifferent; most of them have always felt that they *ought* to know more about the subject in general and the laws in particular. This "ought," however, was too much of the kind characterized by the late Justice Oliver Wendell Holmes as having "only the vague circumference of the notion of duty." And thus the many things in the laws and their operation which now from the medical standpoint appear to need correcting, got a long head start.

This New York amendment will concentrate the attention, where it does not command the interest, of all physicians upon the subject of workmen's compensation. New York's lead in labor legislation has been pretty generally followed in other states, and compensation law amendments are quite freely recognized as in that category.

The occupational disease amendment, which becomes effective September 1, 1935, is drastic (see p. 278).

If "any and all occupational diseases" are to be compensable, what is, and what is not, an *occupational* disease?

Will the ultimate definition be one of law as applied in compensation cases, or one of medical science as applied by the medical profession?

It would seem that there should be only one answer to this question. But this is by no means a certainty. That the ultimate definition of occupational diseases has the probability of *not* being one of medical science applied by the medical profession is evident from the trend of compensation law interpretations. This trend is indicated by the following:

"For many years it has been the unchanging opinion of the medical profession that hernias are not of traumatic origin in the sense that they are rarely the result of a single strain or injury, but, rather, are caused by the successive strains to which the physical body is subjected in the ordinary course of living. Within the last two years the Commission, with its experience acquired in this field, reached the conclusion that the medical profession was not entirely correct in its position on this question."

This was said by the California Industrial Accident Commission, in 1927.[2] It is used by Hugh Cabot[3] in support of the statement that "commissions, composed of laymen, have constituted themselves medical experts." And in support of his further statement that "in this they have had the support of the courts," he cites the following, by the Supreme Court of Wisconsin:

"In this case the trial judge apparently accorded the testimony of these physicians full faith and value. But it does not follow that the Industrial Commission attached any such weight to their testimony nor do we think they were bound to do so. If the testimony of these witnesses was contrary to their own expert knowledge upon the subject, they were at liberty to disregard it."[4]

Workmen's compensation law is quite different, "both in legal conceptions and procedures," from the ordinary branches and forms of law. This difference has already expanded the definition of "accident," by judicial interpretation, to dimensions far beyond any meaning in mind when compensation laws were first enacted. As to what it may do to "occupational disease," by form, by procedure, and by precedent, it is well set to do plenty—unless it is unremittingly watched by medical men. It is by no means too late for them to do now what they "ought" to have done years ago with reference to injuries under compensation acts; but with reference to occupational diseases under these acts it will be too late too soon unless they begin now to develop a participating, rather than a by-standing, interest.

Possibly, in one respect at least (theoretical, rather than practical) the New York occupational disease situation is cleared up a little by the "occupational diseases" amendment.

1. The Doctor's Bill, by Hugh Cabot, p. 103. (Columbia University Press.)

2. "Medical Relations Under Workmen's Compensation," The Bureau of Medical Economics of the A. M. A. 1933, pp. 58-59.

3. The Doctor's Bill, by Hugh Cabot, p. 98.

4. "Medical Relations Under Workmen's Compensation," The Bureau of Medical Economics of the A. M. A., 1933, p. 58.

In the other "schedule" states the relation between the "description of disease" and the "description of process" is definitely stated in the law. In Ohio, for example, the compensation act allows compensation for the occupational diseases named in the first column when contracted by an employee in the course of his employment, provided such disease is due to the nature of any of the processes described in the second column. And in Minnesota compensation is allowed for any of the diseases named in the first column, with the further provision that when the disease is paralleled by a particular line of employment in the second column the disease shall be deemed presumptively to have been due to the nature of that employment.

But in New York there has not been in the law any such indication of what relationship existed between the two columns. The words of the new amendment, "any and all employments enumerated . . .," may establish such a relation.

A Break for the Exhibitors

WHEN they appear at conventions (or conferences) the manufacturers in the line of business to which the meetings relate are usually present as exhibitors. And they are getting the space—and, it is hoped, also the attention—they pay for. The same is true when they appear in the magazines of their various fields of endeavor: they are usually there as advertisers, and they are getting the space—and possibly also the attention—they pay for.

But the participants in the convention program get into print anyhow—if not for the merits of their contributions, then as a matter of "news." The exhibitors, however, are not often given even as much consideration as the "news" recognition implies.

It seems reasonable that they are entitled to more than that. Obviously in many instances the contents of papers and remarks are based upon the scientific advancements which are expressed through the products exhibited. In this and other respects many a successful convention owes a large part of its success to the exhibitors. And few, indeed, are the successful magazines that do not owe fully as much to their advertisers.

We, therefore, bespeak for the exhibitors and their equipment a greater and more evident appreciation of the importance of their relationship to scientific advancement.

May Begin at 40, But Doesn't End at 65

FOR those who find some comfort in Prof. Pitkin's assertion that "life begins at 40" there is still further encouragement in the dictum of the Supreme Court, in the railroad pension case (decided May 6) that life doesn't end at 65. The majority opinion contains this: "It does not follow, as contended, that a man of 65 is inefficient or incompetent. The facts indicate a contrary conclusion."

Age 65 has been a pivotal retirement age in industrial pension systems since their earliest developments, and any study of present plans will find it the center point of the retirements prescribed or accomplished in more than half of them today. The origin of the selection of this age as that when a man's industrial usefulness ceases has no history. It was probably one of those ideas which was "first a catechism, then a code." Once broached, it fell into a channel of reasonableness, or convenience, which led to its general adoption. No one questioned it until industrial executives discovered that pensions were not only costing money, but were also likely to commit their companies to the liability for much more money. Then the exceptions began. The first ones were with respect to the individuals who, for general reasons, generally apparent, were still efficient and competent at the prescribed retirement age—keeping them on the payroll a while longer would have a subduing effect on the pension expense. Later on, when executives began really to think about pensions —when they began to view them less as a matter eleemosynary, and more as a matter managerial —the exceptions began to include certain individuals who, for personal reasons, medically apparent, were not ready to be retired at 65. And, slowly now, the idea is trickling into the executive consciousness that the age of retirement from employment is not for the actuaries to fix generally, upon any basis of custom or statistics, but for the doctor to determine individually, upon the basis of the employee's physical condition. This idea is still in the "catechism" stage. It is inevitable, however, that in time it will become a "code"—with the compulsory retirement age for the employee left open until the industrial physician, upon the basis of medical science specifically applied, shall recommend its specific fixation.

Meanwhile, when *is* a man old? Dr. N. Bovd Anderson has given thought to this question. He says:*

"Our various organs do not cease their functions with a uniform degree. When these involutions are advanced so as to be recognized clinically, then 'age is upon us.' Functional organ retrogression is initiated independently, yet the decreased function of one system soon brings about retrogressive changes in another. Senescence is the result of these retrogressions, old age the resulting complex; and to the internist a man is as old as his arteries, to a surgeon as old as his kidneys. It is not necessary to discuss here the functional changes of senescence, with their skeletal changes, loss of lymphoid structure, digestive disturbances, sluggish circulation, irritated urinary tract, decreased sexual desire, failing vision, etc. If we sum up these functional disturbances and group them as they appear, in the ordinary male they are presbyopia, sexual neurasthenia and a chronic fatigue. The one time powerful virile male recognizes them rather grudgingly, and the oft repeated dressing room phrase is 'I'm not what I used to be'!"

But to be old is not necessarily to be also "inefficient or incompetent." Dr. Anderson covers this point, too:

"Moses was hoary when he led Israel's children from bondage; Dondolo, blind and past 90, stormed Constantinople; in the Doge Palace at Venice hangs one of Titian's masterpieces painted in his one hundredth year; Gladstone, one of England's greatest prime ministers, was elected at 60 years of age and was still serving at 82;

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* Addressing the Medical Study Club, Des Moines, Iowa, April 3, 1935; *J. Iowa M. Soc.*, May, 1935, p. 236.

Goethe's best poems were written after he was 75, as was the best literary work of S. Weir Mitchell; Herbert Spencer was active until his death at the age of 83; Darwin's theory of the descent of man appeared when he was 62; Dr. Jacobi was still actively engaged at 86; Elihu Root was sent to Russia at the age of 72; Edison, at 80, was still in the laboratory."

And the Supreme Court Justices, who find the facts agreeing with the conclusion that a man is not inefficient or incompetent at 65, have, fresh in their minds, the outstanding example of Justice Oliver Wendell Holmes who retired from among them at 94—after nearly three decades of the best work of his life, done while he was in the years past 65.

The matter of age is mentioned also in the minority opinion—a vigorous dissent, written by Chief Justice Charles Evans Hughes and concurred in by Justices Brandeis, Stone and Cardozo. These words—wherein there lies no point of difference as between minority and majority—give industrial medicine the status of highest judicial approval:

"The fundamental consideration which supports this type of legislation is that industry should take care of its human wastage, whether that is due to accident or age. That view can not be dismissed as arbitrary or capricious. It is a reasoned conviction based upon abundant experience."

Full Texts vs. Summaries

WITH new necessities come new laws, and with new laws, new obligations. What are they? Not generally—but specifically and *exactly?* Obviously the only place to find out is the law itself. Descriptions, summaries, condensations, outlines are equally insufficient. The *words* of the law, and all of them, in the sequence, juxtaposition, apposition and context in which they are used, constitute the expression of the legislative intent, and this, therefore, makes it necessary to read the whole law in order to get its meaning.

The importance of statute words in relation to their context is well illustrated by the confusion which existed for 10 years or more in Illinois with reference to the occupational disease act. In one of its sections there were 31 words which seemed obscure as to interpretation. The Supreme Court* resolved the confusion last year by inserting the word "or" in front of the 31 words: their presence in the law was conclusive that the legislature intended them to have a meaning consistent with the context, and the word "or" gave them that meaning. The same confusion is a good example of the insufficiency of both legalistic and lay opinions on meanings of laws prior to the final interpretation of the highest court. Even those who chose to read this act as if the word "or" had not been omitted by the legislature were fearful that if it should be inserted by the Supreme Court the law, in respect of the 31 words at least, would be rather more a "court" enactment than is contemplated by our system of government.

New laws are coming fast. Some of them are constructive, some are only corrective. A number of them are very important in their possible effects on those elements of industrial medicine and surgery which distinguish that specialty from other fields of medical practice. As to those we prefer, where we make note of the enactment of the law, to produce its full text—in words and figures as they appear in the statute book. And so we include in this issue the full texts of four enactments which are highly important to industrial physicians and surgeons and to the industries with which they are affiliated. These are:

(1) the New York compensation law amendment (p. 272);

(2) the New York "occupational diseases" amendment (p. 278);

(3) the new "silicosis act" which West Virginia made effective in March, 1935 (p. 280); and

(4) the law creating the Massachusetts Division of Occupational Hygiene which was effective last year (p. 283).

New York is leading off, with reference to some of the features of its two amendments. Other states can be expected to follow. Already there is a bill in the Massachusetts Legislature (House 2147) providing "for the reference of claims due to industrial diseases to a board of medical referees . . . whose diagnosis shall be binding," and who shall be chosen from a "list of physicians skilled in the diagnosis and treatment of industrial diseases," and from which list "physicians employed by insurance companies are barred." And the creation of an occupational disease "Division," as in Massachusetts and New York or "Bureau," as in Connecticut, is a matter of immediate concern in half a dozen industrial states.

News

HERE are two items of news, but not the kind of news that gets into the newspapers. The first is: "The German government, on January 15, 1935, discontinued unemployment insurance. . . . Hitler had even abolished unemployment insurance for domestic servants, because he discovered that it, in turn, was abolishing domestic employment."[1]

The second is by way of comment.[2] "Labor when employed has not fared as badly as is sometimes believed. The National Industrial Conference Board in a recent report showed that the percentage of the national income which had gone to labor, including wages, salaries, compensation for injuries and pensions, moved up from 63.3% in 1929 to 80.1% in 1932. When it is noted that during the same period the decline in living costs, as shown by the regular standards, was slightly over 20% it is seen that the employed worker was the gainer during those four years. The figures of the United States Department of Commerce show that the receipts of labor in 1933 exceeded by four billion dollars the total income produced during that year. Industry has not been selfish in its efforts to aid recovery."

The connection between these is just not obvious enough so that the advocates of social security by legislation will be able to perceive it. It is contained, however, in a line of the employer's complaint in verse which appeared in these pages last month. This was the line[3]: "Whoso would make me liable must qualify for it." Labor in this country is slowly but certainly forcing that issue.

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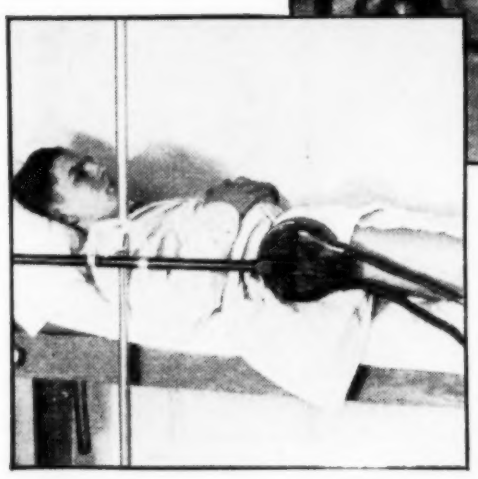
* In *Burns* vs. *Industrial Commission*, 356 Ill., 602.

[1] Gustav Hartz, German economist, in an article entitled "Will America Copy Germany's Mistakes?" written and translated for Pennsylvania Self-Insurers' Association.

[2] *C.P.A. News*, April, 1935.

[3] *Industrial Medicine*, April, 1935, p. 203.

INDUCTOTHERM



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Industrial Medicine and Surgery

Fractures

—Open Reduction of

IN THE indications for attempting ing an open reduction, one should be satisfied: (1) that a satisfactory reduction cannot be obtained and maintained by more conservative methods; (2) that the expected results will be sufficiently better than those hoped for from closed methods as to warrant the additional risk; (3) that the patient presents no other contra-indications to operation; and (4) that the operator has at his command the technic and the skill required for this work.

The usual types of fractures which call routinely for open reduction are as follows:

1. Fractures of the surgical neck of the humerus, with luxation;
2. Olecranon fractures with separation;
3. Fracture of the head of the radius, especially if communited;
4. Dislocation of the carpal semilunar, with or without navicular fracture;
5. Hip fracture with dislocation;
6. Fractures of the patella with separation;
7. Calcaneus fractures;
8. Multiple metatarsal fractures with displacement.

It is also common to operate on the following types of fractures: (1) fractures of the humeral shaft, lower one-third; (2) elbow fractures occasionally; (3) fractures of one or both bones of the forearm if not perfectly reduced; (4) fractures of the femur not reducible with traction; and (5) fractures of the tibia not reducible or with recurring displacement.

Briefly the technic of Smith[1] for the open reduction of fractures is as follows:

Almost without any exception, the minimum preoperative period extends over two days. The skin is thoroughly scrubbed the first day with soap and water, nails trimmed, scrubbed and painted heavily with iodine. Then ether or benzine is applied, the skin dried and painted with a 3.5% solution of iodine in alcohol, which, in turn, is removed with alcohol and sterile dressings applied. This treatment is repeated on the second day. Any blebs, pimples, furuncles or superficial skin infections, if in or near the area of the incision, absolutely contra-indicate operation.

As to technic we are constantly advised that the best is the strict, no-touch "Lane technique" of nothing in the wound except instruments, but we have found no necessity for such assiduous care. Of course, the strictest asepsis is even more necessary in bone work than in abdominal operations because the resistance of bone is much lower, but unless there are sharp ends, which may tear gloves, there is, to the mind of the author, no reason why ligatures may not be tied with the fingers, assuring more rapid and sure hemostasis. If the fingers must be used for orientation about the ends of the bones, a sterile cotton glove may be slipped on for protection against tearing of the rubber glove. In something over 260 open reductions during the past seven years, there have been only four infections to occur and only two of these gave much trouble.

After the fragments have been brought into apposition, the type of fixation must be determined. If possible, the tendency is to use no foreign material, but nothing is so embarrassing as to have displacement recur after an open reduction, and before the incision is closed one should make the best of his opportunities. The main risks have already been taken. If some form of internal fixation is used it should be amply strong and secure. If bands or plates are used, the patient should be advised later that these should come out in six weeks. However, unless they are giving trouble most patients will not have them out, and in the author's experience 98% have no further trouble if their plates or bands are not removed.

After fixation is introduced, suitable protection as splints or casts must, of course, be applied, and about the same after-care as closed reduction is followed.

—Personal Experiences with

A NUMBER of principles have been neglected in the handling of fractures:[2] (1) Within the past 15 years it has become a slogan to "splint them where they lie." War experience indicates the need for the general adoption of this principle. It is nevertheless neglected. (2) That adequate diagnosis and early application of conservative methods of reduction and immobilization give satisfactory results in the vast majority of cases is appreciated but not effectively practiced. (3) Results are dependent largely on after-care, provided adequate reduction has been accomplished. (4) Atrophic changes from disuse are the most important contra-indication to prolonged immobilization.

The radiologic evidence of bone atrophy from disuse is sometimes mistaken for infectious arthritis when the bones of the hand and foot are involved. The loss of bone density is at times extreme; there is almost a moth-eaten appearance. Anything which will favor recalcification should be used when the condition has developed.

Parathyroid extract, carbon arc radiation, contrast baths, active motion and massage are useful.

The most important single factor, however, should be an effort to prevent the occurrence of bone atrophy by early painless active motion, massage and heat; in a word, all forms of vascular gymnastics.

The promiscuous use of various forms of physiotherapy cannot take the place of heat, well applied massage and graded active exercise.

Traction and suspension methods are valuable in proportion as the surgeon realizes that they are based on the principle of equilibrium of forces. Successful application is not dependent on frames, weights, or pulleys, but on an intelligent application of a knowledge of physics to overcome disturbed anatomy.

Traction and suspension methods are valuable in definite groups.

When, because of failure to obtain satisfactory reduction with conservative methods, operation is decided upon we should be careful to observe definite rules as to the operator and the patient.

The rules which govern the selection of procedure should be based on the fitness of the surgeon and his equipment to carry out adequately the proposed operation. This calls for a just appraisal of our own fitness to perform an operation which may be perfectly safe in other hands. We might as well admit that this is not an easy conclusion to reach, yet in fairness to the life and welfare of the patient and society it is an important one.

The splendid results which some of the masters of technic have reported have given many doctors an unwarranted impression of the ease with which such results can be duplicated. Many who are neither qualified by training nor environment pursue the operative plan of treatment to the ultimate harm of their patients. The bad end-results thus obtained do not usually find their way into the literature.

If the surgeon is capable and his equipment adequate, the next consideration should be the general and local conditions of the patient.

Bone repair is not active in the aged.

Infection is a contraindication to operation on bone.

Foreign bodies, such as plates, should not be introduced in the presence of infection.

Reliance on internal fixation, overlooking the danger of necrosis which follows infection of bone, is not a desirable practice.

When operation is to be done because of delayed union it is as essential to remove the cartilaginous substance from the free ends as it is to obtain end-to-end fixation. Unless this is done the endosteal callus will not form and all dependence will be placed on the unsheathing callus.

There has been much discussion as to when roentgenograms should be made in traumatic cases; the following conditions have been found to be noteworthy:

1. Always when a fracture is suspected. After careful examination many patients who have no deformity, but just localized pain, limitation of motion or weight-bearing, will often be found by a radiographic examination to have a fracture. The diagnosis of a sprain is not tenable if an x-ray examination has not been made. Too often we have seen fractures which might easily have been overlooked if this had not been a conviction.
2. When a deformity is present, as a matter of record.
3. After reduction, also for record, and for guidance as to further indications for treatment if the initial efforts have been unsuccessful.

5. Before weight-bearing or active work is resumed.

—of the Mandible

THE most frequent site of the occurrence of this type of fracture is in the region of the mental foramen; in one series of cases reported[3] of all the double fractures, 77% were located at the mental foramen on one side and at the angle of the opposite side.

In considering treatment, it is necessary to know in detail the muscular groups involved.

There are two methods of holding the fragments in the correct position, one being to hold them in their proper relation to the upper jaw and the other to fix directly the broken fragments to each other. Fixation by a Barton or four-tailed bandage is not to be recommended as it generally causes backward pressure on the chin which will tend to produce more displacement.

The most common as well as most efficient method is fixation by wiring. In using this method it is preferable to have the teeth cleansed of tartar before applying the wires in order to prevent gingivitis. An eyelet made of 24 gauge brass is applied to a lower tooth and another to a corresponding upper tooth. The upper and lower eyelets are then connected by a wire, the teeth brought into occlusion and the ends of the connecting wire twisted together. A similar procedure is done upon the opposite side of the mouth and possible a third set of teeth should be treated. The wires tend to loosen in a few days and should be tightened. The slight motion of the jaws due to loosening of the wires, as compared to absolute rigidity of splints is an advantage in the later stages of treatment as it tends to stimulate bone regeneration. If the sharp ends of the wires are irritating to the inner surfaces of the cheek, they should be covered by molding compound.

Fixation by wiring or plating the bone fragments should never be attempted in recent fractures which communicate with the mouth because of the danger of infection. Roots of teeth encroaching on the line of fracture frequently give rise to infection and, as a general rule, should be removed. The fractured line often extends into an alveolar process, surrounding the apex of a tooth, which causes devitalized teeth that should be removed. These teeth should, however, be distinguished from loose teeth which are not necessarily devitalized.

The third method of treatment is by dental splints. This requires the technical skill of a dentist for its construction and must be made for the individual case. It demands considerable experience and at least two days of time, which would involve much expense.

The complications are four in number. The first is osteomyelitis, which may be local or diffuse. It is fortunately uncommon. Syphilis is a very frequent complication. The third and most important complication is malocclusion, which may occur in even the simplest case. The causes of malocclusion have already been discussed in the consideration of the muscular action of the bone. The fourth complication is malunion.

Wright concludes that: (1) The most exact criterion for a correct alignment of the fragments is the occlusion of the teeth; (2) roentgen examination should include the entire jaw; and (3) resorption about the fracture shows for a long period and is often interpreted as non-union.

—of the Vertebrae

ROBERTSON[4] reviewed the records of 34 consecutive cases of compression fracture and compression fracture-dislocation of the spine. In 34 cases, 46 vertebral bodies were involved, the fracture being distal to the tenth dorsal in 34 instances.

In this series, symptoms were frequently not marked; localized pain on pressure and attempts at motion were probably the most constant findings. The history showed that some trauma had been suffered and this was often mild.

In diagnosis, lateral roentgenograms are usually of more value than antero-posterior plates.

Briefly, treatment may be divided into three phases, the first, that of first aid and transportation; the second, reduction and treatment of associates injuries; and the third, post-reduction and convalescence.

The following conclusions were reached in this study:

In 34 consecutive cases of compression fracture and compression fracture-dislocation of the spine treated within the past five years 46 vertebral bodies were involved. In 22 of the cases the injury was sustained in an automobile accident.

Fracture of the spine should be suspected in all cases giving a history of trauma, in which so-called tenderness on pressure or localized pain on spine motion is found. Accurate diagnosis can only be made by roentgen ray studies which should always include a lateral view.

Cases with suspected fracture should not be permitted to sit or stand and should be transported in the prone position.

Anatomical reduction of the fragments results in decreased disability, and can be readily obtained in the lower dorsal and entire lumbar area in fresh cases by the Rogers' method.

Recumbency should be maintained for approximately 12 weeks following reduction.

A spine brace should be worn after weight bearing is resumed until normal bone density is restored.

—Leg Traction in

REFERENCE is made[5] to the use of an apparatus devised by Dr. Roger Anderson for treating fractures of the pelvis and lower extremities, combining skeletal traction and well leg counter-traction.

A full description of the apparatus and its application is given, with case histories regarding various types of fractures, including unilateral fracture of the pelvis, central fracture of the neck of the femur, intertrochanteric fractures of the femur, acute fractures of the shaft of the femur, fractures of the shaft of the femur with malunion, delayed union, nonunion, and shortening, comminuted fractures of the upper end of the tibia extending into the knee joint, and fractures of the shaft of the tibia.

The author's summary follows:

"There is a very definite field of application for this apparatus. It is undoubtedly the most efficient method of treating unilateral fractures of the pelvis, intertrochanteric fractures and fractures of the upper end of the tibia involving the joint surface which need traction. It is obvious that the apparatus described is only applicable to unilateral fractures of the pelvis or lower extremity where traction through the long axis of the limb is desired.

"Many objections have been raised to the use of the Steinman pin, but I have not experienced any difficulty which would cause me to hesitate in its use. This may be and probably is due to the fact that I do not make skin incisions for the introduction of the pin; consequently there is no more danger of carrying infection into the bone than there is in introducing a hypodermic needle. I have left one pin in as long as six months without infection.

"Experience with this apparatus has taught me that in old patients with arteriosclerosis, diabetes, and similar circulatory disturbances of the extremities it is necessary to use extreme caution in applying the apparatus, and the surgeon should be constantly on the look out pressure necrosis over the sole of the sound foot. If it is necessary to apply much traction this should be done for only a short period of time and then released, so that circulation can be re-established in the sole of the foot on the sound side.

"It is probable that in the hands of other surgeons a broader field for the use of the Roger Anderson apparatus will be found, and results may be more satisfactory in some of the fractures in which I have found it unsuccessful. It is not to be expected that one method will be satisfactory to all surgeons, as the important thing is the surgeon rather than the splint."

References:

1. Smith, Howard O., *Texas State Jour. of Med.*, December, 1933.
2. Cohn, Isidore, *Texas State Jour. of Med.*, December, 1933.
3. Wright, Chauncey B., *West Va. Med. Jour.*, December, 1933.
4. Robertson, Robt. C., *Jour. Tenn. State Med. Assn.*, November, 1933.
5. Bost, James R., *Texas State Jour. of Med.*, December, 1933.

Fixed Ratio

THE Builders & Manufacturers Mutual Casualty of Chicago, which some time ago started basing its compensation rates on the man hour basis instead of on the payroll, has found that the number of hours per accident seems to be a remarkably fixed ratio. The company found, for instance, that the number of accidents per million hours of work in 1932 varied only minutely from the same factor in 1931. The 1933 results have not yet been tabulated. Expressed in other terms, it means that the number of hours required to produce an accident does not vary to an appreciable extent, over a period of time. This fixity of ratio is in contrast to the fluctuations on the payroll basis.—**National Underwriter.**

Workmen's Compensation

New York Amendment

THE "O'BRIEN bill," amending the New York State Workmen's Compensation law in respect of certain practices referred to as "medical abuses" was approved by the Governor on March 28, 1935, becoming Chapter 258 of the laws of 1935, and going into effect July 1, 1935. The full text of the law follows:

AN ACT to amend the workmen's compensation law and the labor law, in relation to treatment and care of injured employees, providing for the selection by the injured employees of physicians authorized by the industrial commissioner to render medical treatment and care, empowering the industrial commissioner to establish a schedule of minimum charges and fees, enlarging the membership of the industrial council, and making an appropriation.

SECTION 1. Section thirteen of chapter eight hundred and sixteen of the laws of nineteen hundred thirteen, entitled "An act in relation to assuring compensation for injuries or death of certain employees in the course of their employment and repealing certain sections of the labor law, and relating thereto, constituting chapter sixty-seven of the consolidated laws," as amended and reenacted by chapter forty-one of the laws of nineteen hundred fourteen and as last amended by chapter five hundred and fifty-three of the laws of nineteen hundred twenty-seven, is hereby amended to read as follows:

§ 13. **Treatment and care of injured employees.** (a) The employer shall promptly provide for an injured employee such medical, surgical or other attendance or treatment, nurse and hospital service, medicine, crutches and apparatus for such period as the nature of the injury or the process of recovery may require. The employer shall be liable for the payment of the expenses of medical, surgical or other attendance or treatment, nurse and hospital service, medicine, crutches, and apparatus necessitated by the injury of an employee, for such period as the nature of the injury or the process of recovery may require. All fees and other charges for such treatment and services shall be limited to such charges as prevail in the same community for similar treatment of injured persons of a like standard of living.

The commissioner shall prepare and establish a schedule for the state, or schedules limited to defined localities, of minimum charges and fees for such medical treatment and care, to be determined in accordance with and to be subject to change pursuant to rules promulgated by the commissioner. Before preparing such schedule for the state or schedules for limited localities the commissioner shall request the president of the medical society of the state of New York to submit to him a report on the amount of remuneration deemed by such society to be fair and adequate for the types of medical care to be rendered under this chapter, but consideration shall be given to the view of other interested parties. The amounts payable by the employer for such treatment and services shall in no case be less than the fees and charges established by such schedule. Nothing in this schedule, however, shall prevent voluntary payment of amounts higher than the fees and charges fixed therein, but no physician rendering medical treatment or care may receive payment in any higher amount unless such increased amount has been authorized by the employer, or by decision as provided in section thirteen-g herein.

(b) In the case of persons, injured outside of this state, but entitled to compensation or benefits under this chapter, the provisions as to selection of authorized physicians shall be inapplicable. In such cases the employer shall promptly provide all necessary medical treatment and care but if the employer fail to provide the same, after request by the injured employee such injured employee may do so at the expense of the employer. The employee shall not be entitled to recover any amount expended by him for such treatment or services unless he shall have requested the employer to furnish the same and the employer shall have refused or neglected to do so, or unless the nature of the injury required such treatment and services and the employer or his superintendent or foreman having knowledge of such injury shall have neglected to provide the same; nor shall any claim for medical or surgical treatment be valid and enforceable, as against such employer, unless within twenty days following the first treatment, the physican giving such treatment, furnish to the employer and the industrial commissioner a report of such injury and treatment, on a form prescribed by the industrial commissioner. The board may, however, by the unanimous vote of all the qualified members, excuse the failure to give such notice within twenty days when it finds it to be in the interest of justice to do so, and may subject to the limitaions contained in section twenty-eight of this chapter, make an award for the reasonable value of such medical or surgical treatment. All fees and other charges for such treatment and services, whether furnished by the employer or otherwise, shall be subject to regulation by the board as provided in section twenty-four of this chapter, and shall be limited to such charges as prevail in the same community for similar treatment of injured persons of a like standard of living.

(c) The liability of an employer for medical treatment as herein provided shall not be affected by the fact that his employee was injured through the fault or negligence of a third party, not in the same employ, unless and until notice of election to sue or the bringing of suit against such third party. The employer shall however, have an additional cause of action against such third party to recover any amounts paid by him for such medical treatment, in like manner as provided in section twenty-nine of this chapter.

(d) The industrial board, on its own motion, or a referee, upon the recommendation of the chief medical examiner for the workmen's compensation division, hearing a claim for compensation may require examination of any claimant by a physician especially qualified with respect to the diagnosis or treatment of the disability for which compensation is claimed; and may require a report from such physician on the diagnosis, the casual relationship between the alleged injury and subsequent disability, proper treatment, and the extent of the disability of such claimant. The physician to conduct the examination shall be designated by the commissioner from a panel of especially qualified physicians submitted to him by the medical society of the county, or any other board acting for any school of medical practice. Additional names for such panel shall be furnished by the society whenever requested by the commissioner and if such request is not complied with in thirty days the industrial commissioner may add thereto names of his own selection. The employer or his insurance carrier shall pay for such examination in an amount to be directed by the industrial commissioner.

§ 2. Such chapter is amended by inserting therein ten new sections, to be sections thirteen-a to thirteen-j inclusive, to read, respectively, as follows:

§ 13-a. **Selection of authorized physician by employee.** (1) An injured employee may, when care is required, select to treat him any physician authorized by the commissioner to render medical care, as hereafter provided. If for any reason during the period when medical treatment and care is required, the employee wishes to transfer his treatment and care to another authorized physician, he may do so, in accordance with rules prescribed by the commissioner. In such instance the remuneration of the physician whose services are being dispensed with shall be limited to the value of treatment rendered at minimum fees as established in the schedule for his location, unless payment in higher amounts has been approved as authorized in section thirteen, paragraph a. If the employee is unable due to the nature of the injury to select such authorized physician and the emergency nature of the injury requires immediate medical treatment and care, or if he does not desire to select a physician, and in writing so advises the employer, the employer shall promptly provide him with the necessary medical care, provided however, that nothing herein contained shall operate to prevent such employee, when subsequently able to do so, from selecting for continuance of any medical treatment or care required, any physician authorized by the commissioner to render medical care as hereinafter provided.

(2) The commissioner shall prescribe the form of a notice inform-

ing employees of their privilege under this chapter, and such notice shall be posted and maintained by the employer in a conspicuous place or places in and about his place or places of business.

(3) The employer shall have the right to transfer the care of an injured employee from the attending physician, whether chosen originally by the employee or by the employer, to another authorized physician (1) if the interest of the injured employee necessitates the transfer or (2) if the physician has not been authorized to treat injured employees under this act or (3) if he has not been authorized under this act to treat the particular injury or condition as provided by section thirteen-b (2). An authorized physician from whom the case has been transferred shall have the right of appeal to an arbitration committee as provided in subdivision two of section thirteen-g and if said arbitration committee finds that the transfer was not authorized by this section, said employer shall pay to the physician a sum equal to the total fee earned by the physician to whom the care of the injured employee has been transferred, or such proportion of said fee as the arbitration committee shall deem adequate.

(4) No claim for medical or surgical treatment shall be valid and enforceable, as against such employer, or employee, unless within forty-eight hours following the first treatment the physician giving such treatment furnish to the employer and the industrial commissioner a preliminary notice of such injury and treatment, and within twenty days thereafter a more complete report on a form prescribed by the industrial commissioner. The industrial board may excuse the failure to give such notices within the designated periods when it finds it to be in the interest of justice to do so. Upon receipt of the notice herein provided the employer shall be entitled to have claimant examined by a qualified physician at a place reasonably convenient to the claimant and in the presence of the claimant's physician, and refusal by the claimant to submit to such examination at such time or times as may reasonably be necessary in the opinion of the industrial board, shall bar the claimant from recovering compensation for any period during which he has refused to submit to such examination.

(5) No claim for specialist consultations, surgical operations, or physiotherapeutic procedures costing more than twenty-five dollars shall be valid and enforceable, as against such employer, unless such special services shall have been authorized by the employer or by the commissioner, or unless such authorization shall have been unreasonably withheld, or unless such special services are required in an emergency. No claim for X-ray examinations or special diagnostic laboratory tests costing more than ten dollars shall be valid and enforceable, as against such employer, unless such special services shall have been authorized by the employer or by the commissioner, or unless such authorization shall have been unreasonably withheld, or unless such special services are required in an emergency.

§ 13-b. **Authorization of physicians by commissioner.** 1. The commissioner shall upon the recommendation of the medical society of each county or of a board designated by such county society, or by a board representing duly licensed physicians of any other school of medical practice, authorize physicians licensed to practice medicine in the state of New York to render medical care under this chapter. If within sixty days after the commissioner requests such recommendations, the medical society of any county or board fails to act, or if there is no such society in a county, the commissioner shall designate a board of three qualified physicians who shall make the requested recommendations. No such authorization shall be made in the absence of recommendation of the appropriate society or board or of review and recommendation of the industrial council as provided in clause (g) of subdivision four of section ten-a of the labor law. No person shall render medical care under this chapter without such authorization of the commissioner, provided, that: (a) emergency (first aid) medical care may be rendered under this chapter by any physician licensed to practice medicine in the state of New York without authorization by the commissioner under this section; and

(b) a licensed physician who is a member of a constituted medical staff of any hospital may render medical care under this chapter while an injured employee remains a patient in such hospital; and

(c) under the active and personal supervision of an authorized physician medical care may be rendered by a registered nurse, physiotherapist or other persons trained in laboratory or diagnostic technics within the scope of such person's specialized training and qualifications. This supervision shall be evidenced by signed records of instructions for treatment and signed records of the patient's condition and progress. Reports of such treatment and supervision shall be made by such physician to the commissioner on such forms and at such times as the commissioner may require.

2. A physician licensed to practice medicine in the state of New York who is desirous of being authorized to render medical care under this chapter, shall file with the medical society in the county in which his office is located, or with a board designated by such society, or by a board designated by the commissioner as provided in section thirteen-b, an application for authorization under this chapter. In such application he shall state his training and qualifications and shall agree to limit his professional activities under this chapter to such medical care as his experience and training qualify him to render. He shall further agree to refrain from subsequently treating for remuneration, as a private patient, any person seeking medical treatment in connection with, or as a result of, any injury compensable under this chapter, if he has been removed from the list of physicians authorized to render medical care under this chapter, or if the person seeking such treatment has been transferred from his care in accordance with the provisions of this chapter. This agreement shall run to the benefit of the injured person so treated and shall be available to him as a defense in any action by such physician for payment for treatment rendered by a physician after he has been removed from the list of physicians authorized to render medical care under this chapter, or after the injured person was transferred from his care in accordance with the provisions of this chapter. The medical society or a board designated by it, or by a board as otherwise provided in section thirteen-b, if it deem such licensed physician duly qualified, shall recommend to the commissioner that such physician be authorized to render medical care under this chapter, and such recommendation and authorization shall specify the character of the medical care which such physician is qualified and authorized to render under this chapter. A licensed physician may present to the medical society or board evidences of additional qualifications at any time subsequent to his original application. If the medical society or board fails to recommend to the commissioner that a physician be authorized to render medical care under this chapter, the physician may appeal to the industrial council as provided in clause (g) of subdivision four of section ten-a of the labor law.

3. Laboratories and bureaus engaged in x-ray diagnosis or treatment or in physiotherapy or other therapeutic procedures and which participate in the diagnosis or treatment of injured workmen under this chapter shall be operated or supervised by qualified physicians duly authorized under this chapter. The person in charge of diagnostic clinical laboratories duly authorized under this chapter shall possess the qualifications established by the public health council for approval by the state commissioner of health or, in the city of New York, the qualifications approved by the board of health of said city and shall maintain the standards of work required for such approval.

§ 13-c. **Licensing of compensation medical bureaus.** (1) The commissioner may, upon the recommendation of the medical society of each county or of a board designated by such county society, or of a board as provided in section thirteen-b, authorize and license compensation medical bureaus, maintained by qualified physicians wholly or principally for the diagnosis and treatment of industrial injuries or illnesses in respect of which they are authorized to render medical care under this chapter. Application for such authorization shall be made on forms to be furnished by the commissioner and shall disclose in full the nature of the personnel and equipment of such bureaus. No such authorization shall be made in the absence of recommendation from the appropriate society or board. Each such bureau which receives such authorization shall:

(a) Make reports on its personnel and equipment in such form and at

such times as may be required by the commissioner; and

(b) be subject to inspection by the commissioner or the medical society of the county in which such bureau is located; and

(c) pay to the commissioner a license fee of fifty dollars per annum for each office of such bureau.

§ 13-d. **Removal of physicians from lists of those authorized to render medical care.** 1. The medical society or board that has recommended the authorization of physicians to render medical care under this chapter shall investigate, hear and determine all charges of professional or other misconduct by any authorized physician, or by any compensation medical bureau licensed as herein provided, under rules and procedure to be prescribed by the industrial council of the department of labor and shall report evidence of such misconduct, with their determination thereon, to the commissioner. Such investigation, hearing, report and determination may be made by the board of an adjoining county upon the request of the medical society of the county in which the alleged misconduct or infraction of this chapter occurred. The industrial council of the department may review the determination of such medical society or board, and on application of the physician accused must do so, and may reopen the matter and receive further evidence. The decision and recommendation of such industrial council shall be final, binding and conclusive upon the industrial commissioner.

2. The commissioner shall remove from the list of physicians authorized to render medical care under this chapter the name of any physician who he shall find after reasonable investigation is disqualified because such physician (a) has been guilty of professional or other misconduct or incompetency in connection with medical services rendered under this chapter; or

(b) has exceeded the limits of his professional competence in rendering medical care under this chapter or has made materially false statements concerning his qualifiations in his application for the recommendation of the medical society in the county in which his office is located, or of the board designated by it, or of a board as provided in section thirteen-b; or

(c) has failed to submit full and truthful medical reports required to be made by him to the commissioner, or the industrial board; or

(d) has rendered medical service under this chapter for a fee less than fixed by the commissioner as the minimum rate in his locality; or

(e) has participated in the division, transference, assignment, rebating, splitting or refunding of a fee for medical care under this chapter; or

(f) has solicited, or has employed another to solicit for himself or for another the professional treatment, examination or care of an injured employee in connection with any claim under this chapter.

Nothing in this section shall be construed as limiting in any respect the power or duty of the commissioner to investigate instances of misconduct, either before or after investigation by a medical society or board as herein provided, or to temporarily suspend the authorization of any physician that he may believe to be guilty of such misconduct.

§ 13-e. **Revocation of licenses to compensation medical bureaus.** The commissioner shall revoke the license of any compensation medical bureau upon a finding certified to him by the medical society, or board designed by such county medical society, or by a board as provided in section thirteen-b, that has recommended the licensing of such compensation medical bureau, or by the industrial council, that such bureau has been guilty of professional or other misconduct, or of violation of the provisions of this chapter, or that the personnel of such bureau is not properly qualified under this chapter or that the equipment of such bureau is inadequate for the proper rendering of medical care.

A medical society or board may upon direction of the commissioner or upon its own motion investigate the alleged disqualification, as defined in this section, of any physician whose authorization to render medical care under this chapter it had previously recommended, or the alleged grounds for revocation of the license of any compensation medical bureau whose licensing it had previously recommended. Such physician or bureau shall be notified of the charges against him or it and shall be given reasonable opportunity to be heard and to present evidence in his or its behalf. Upon the completion of its investigation such society or board shall communicate its findings to the commissioner and to the physician or bureau whose conduct was investigated, and shall file with the commissioner a record of the evidence upon which such findings were based.

Nothing in this section shall be construed as limiting in any respect the power or duty of the commissioner to investigate instances of misconduct, either before or after investigation by a medical society or board as herein provided, or to temporarily suspend the license of any compensation medical bureau that he may believe to be guilty of such misconduct.

§ 13-f. **Payment of medical fees.** (1) Fees for medical services shall be payable only to a physician or other lawfully qualified person permitted by section thirteen-b of this chapter to render medical care under this chapter, or to the agent or to the executor or administrator of the estate of such physician. No physician rendering treatment to a compensation claimant, shall collect or receive a fee from such claimant within this state, but shall have recourse for payment of services rendered only to the employer under the provisions of this chapter. Hospitals shall not be entitled to receive the remuneration paid to physicians on their staff for medical and surgical services.

(2) Whenever his attendance at a hearing is required, the physician of the injured employee shall be entitled to receive a fee from the employer, or carrier, in an amount to be fixed by the commissioner in addition to any fee payable under section one hundred twenty.

§ 13-g. **Payment of bills for medical care.** (1) Unless within thirty days after a bill has been rendered to the employer by the physician or hospital which has treated an injured employee, such employer shall have notified the commissioner and such physician or hospital in writing that such employer demands an impartial examination of the fairness of the amount claimed by such physician or hospital for his or its services, the right to such an impartial examination shall be deemed to be waived and the amount claimed by such physician or hospital shall be deemed to be the fair value of the services rendered by him or it.

(2) If the parties fail to agree as to the value of medical aid rendered under this chapter such value shall be decided by an arbitration committee consisting of two physicians designated by the president of the medical society of the county in which the claimant resides, and two physicians, also members of the medical society of the state of New York, appointed by the employer or carrier. The majority decision of the arbitration committee shall be conclusive upon the parties as to the value of the services rendered. In the event of equal division, the committee shall select a fifth physician, also a member of the medical society of the state of New York, whose decision shall be conclusive. If the physician whose charges are being arbitrated is a member in good standing of the New York Osteopathic Society or the New York Homeopathic Society, the members of such arbitration committee to be appointed similarly, shall be physicians of such organization and the president of such organization shall make the designation provided herein.

(3) The parties to arbitration proceedings under this section shall each pay to the industrial commissioner a sum equal to five per centum of the amount payable under such decision, or a minimum of two dollars, whichever is greater. From sums so collected the commissioner shall pay to each member of the arbitration committee, a per diem fee of ten dollars for each arbitration session attended.

§ 13-h. **Medical treatment by public hospitals.** Hospitals maintained wholly by public taxation may treat only emergency cases under this chapter, and may treat such emergency cases only so long as the emergency exists. This section shall not be applicable, where there is not available a hospital other than a hospital maintained by taxation, nor shall it prevent any municipal, county or state hospital from rendering medical services to employees of such hospital or such political subdivision.

§ 13-i. **Solicitation prohibited.** Any person who shall make it a business to solicit employment for any person authorized by this chapter to render medical care to an injured employee in connection with any claim under this chapter, shall be guilty of a misdemeanor, except that the employer shall have the right subject to regulations prescribed by the commission, to recommend to the injured employee the names of enrolled physicians who he believes to be competent to treat him.

§ 13-j. **Medical or surgical treatment by insurance carriers and employers.** (1) An insurance carrier shall not participate in the treatment of injured workmen, except, that it may employ medical inspectors to

examine compensation cases periodically, while under treatment, and report upon the adequacy of medical care, and other matters relative to the medical conduct of the case. (2) An employer may maintain a compensation medical bureau at the place or places of employment, if such bureau is required because of the nature of the industrial hazards, or the frequency of injuries to employees arising out of industry. Such bureau or bureaus shall be authorized and licensed pursuant to section thirteen-c, and their use by an injured employee shall be optional in accordance with the provisions of section thirteen-a.

§ 3. Section twenty-four of such chapter, as last amended by chapter six hundred fifteen of the laws of nineteen hundred twenty-two, is hereby amended to read as follows:

§ 24. **Costs and fees.** If the court before which any proceedings for compensation or concerning an award of compensation have been brought, under this chapter, determine that such proceedings have not been so brought upon reasonable ground, it shall assess the cost of the proceedings upon the party who has so brought them. Claims of attorneys and counselors-at-law for legal services in connection with any claim arising under this chapter, and claims for services or treatment rendered or supplies furnished pursuant to subdivision (b) of section thirteen of this chapter, shall not be enforceable unless approved by the board. If so approved, such claim or claims shall become a lien upon the compensation awarded, but shall be paid therefrom only in the manner fixed by the board. Any other person, firm or corporation who shall exact or receive fee or gratuity for any services rendered on behalf of a claimant except in an amount determined by the board, shall be guilty of a misdemeanor. Any person, firm or corporation who shall solicit the business of appearing before the board on behalf of a claimant, or who shall make it a business to solicit employment for a lawyer in connection with any claim for compensation under this chapter shall be guilty of a misdemeanor. In case an award is affrmed upon an appeal to the appellate division, the same shall be payable with interest thereon from the date when said award was made by the board.

§ 4. Section ten-a of chapter fifty of the laws of nineteen hundred twenty-one, entitled "An act in relation to labor, constituting chapter thirty-one of the consolidated laws," as added by chapter four hundred sixty-four of the laws of nineteen hundred twenty - four and last amended by chapter one hundred sixty-six of the laws of nineteen hundred twenty - seven, is hereby amended to read as follows:

§ 10-a. **Industrial council.** 1. To advise the commissioner, there shall continue to be in the department an industrial council composed of fifteen members appointed by the governor. Five members of the council shall be persons known to represent the interests of employees, five shall be persons known to represent the interests of employers, and five shall be physicians licensed to practice in this state and known to represent the schools of medical practice eligible to practice under the workmen's compensation law. The governor may remove any member of the council when such member ceases to represent the interests in whose behalf he was appointed, or, in the case of the members who are physicians, ceases to be licensed to practice.

2. The commissioner shall be an additional member of such council and act as chairman thereof. The chairman of the industrial board shall also be an additional member of such council and shall be vice-chairman thereof, to act in the absence of the commissioner. The commissioner shall designate an employee of the department to act as secretary to the council and shall detail from time to time to the assistance of the council such employees as may be necessary.

3. The members of the council shall be entitled to compensation at the rate of not exceeding ten dollars per day for each meeting attended by them, or each day actually spent in the work of the council. They shall also be paid their reasonable and necessary traveling and other expenses while engaged in the performance of their duties.

4. The council shall (a) consider all matters submitted to it by the industrial commissioner and advise him with respect thereto; (b) on its own initiative recommend to the commissioner such changes of administration as, after consideration, may be deemed important and necessary; (c) cooperate with the civil service commission in conducting examinations and in preparing lists of eligibles for positions, the duties of which require special knowledge or training, and advise the commissioner in the selection and appointment of employees to such positions; (d) consider all matters connected with the practice of medicine submitted to it by the commissioner or the industrial board; (e) consider the qualifications for, or persons being considered for appointment by the commissioner to positions directly involving the practice of medicine, and advise the commissioner regarding the fitness of such persons for appointment; (f) prescribe rules and regulations to govern the procedure of investigations and hearings by medical societies or boards of charges against authorized physicians and licensed compensation medical bureaus as provided in section thirteen-d of the workmen's compensation law; (g) investigate on its own initiative charges made by a physician that he has been improperly refused authorization to do compensation work by a medical society or board, or by the commissioner and, if it sustain the charges, recommend such authorization to the commissioner; (h) on its own initiative investigate and pass on charges of misconduct by either a physician or a compensation bureau authorized to treat injured workmen under this chapter; (i) review the determination of charges of misconduct where the physicians accused appeals from the decision of the medical society or board which took jurisdiction in the first instance. In such cases the council may reopen the matter and receive further evidence. And the decision and recommendation of the council shall be final, binding and conclusive upon the industrial commissioner.

5. The council shall adopt rules and regulations to govern its own proceedings. The secretary shall keep a complete record of all its proceedings which shall show the names of the members present at each meeting and every matter submitted to the council by the commissioner and the action of the council hereon. The record shall be filed in the office of the department. All records and other documents of the department shall be subject to inspection by the members of the council.

6. The duties and powers of the council shall not extend to any matters affecting the administration of the state insurance fund.

The provisions of sections nineteen-a and nineteen-b of the workmen's compensation law limiting and restricting professional activities of physicians or surgeons in the employ of the department, shall also be applicable to and binding upon members of the council.

§ 5. The sum of twenty-five thousand dollars ($25,000), or so much thereof as may be necessary, is hereby appropriated to the department of labor from any moneys in the state treasury not otherwise appropriated to pay the expenses of the department, including personal service and maintenance, in carrying out the provisions of the workmen's compensation law and the labor law, as amended by this act, payable from the state treasury on the audit and warrant of the comptroller on certification as provided for in section twelve-a of the state finance law.

§ 6. This act shall take effect July first, nineteen hundred thirty-five.

Injection Treatment For Hernia

TO THE EDITOR (J.A.M.A.*): Is the treatment of hernia by injection of sclerosing solutions a sound procedure? This matter has been recalled to my attention through the recent promotion of Pina-Mestre's Solution proposed for that purpose.

M. D., Arkansas.

ANSWER—Pina-Mestre's Solution, manufactured by Dr. E. Pina-Mestre of Barcelona, Spain, was declared not acceptable for inclusion in New and Nonofficial Remedies (The Journal, Feb. 1, 1930, p. 339). At that time, however, it was known as Hernial (Inyecciones Proliferantes Obturadoras del Dr. E. Pina-Mestre). The formula was then stated to be as follows:

"Each ampule contains approximately 98% of alcohol and the balance consists of the following ingredients expressed in percentages: 25% Krameria, 16% Catechu, 15% Rosa Canina, 15% Rosa Centifolia, 14% Vaccinium Myrtillus, 15% Monesia."

The attempted cure of hernia by the application of John Hunter's theory of "adhesive inflammation" is not new nor original with Dr. Pina-Mestre. Injection of irritants of varying sorts into the inguinal canal was

*J.A.M.A., May 4, 1935, p. 1658.

performed successfully almost a century ago by Velpeau.

The results obtained perhaps compared favorably at that time with those following surgical repair, but it must be remembered (1) that aseptic surgery was then unknown and (2) that infection of herniorrhaphy wounds predisposes greatly to recurrence. The indiscriminate spreading of severely irritant substances throughout an area containing such delicate structures as the inguinal canal with the frequent presence in the sac of intestine, omentum, bladder, ovary or other abdominal viscera is most hazardous. Once the substance is injected, its distribution is beyond control. While dense scar formation might be eminently desirable at a given site, it might be equally objectionable in another area. For example, any substance that will produce adhesions in the inguinal canal around the hernia may produce adhesions in the peritoneal cavity, which is continuous with the hernial sac. Because this procedure is advocated for office use, the occurrence of perforation of the bowel with peritonitis, of some viscus, of the deep epigastric artery (in inguinal hernia) or even of the femoral artery itself (infemoral hernia) is particularly dangerous. It would be most difficult to effect ligation of either of these vessels in the office of the general pratitioner. Such injury would be an urgent surgical emergency.

It may be said that after the recognized operations for hernia the normal anatomy of the region is somewhat altered but the result is practically as satisfactory, structurally and functionally, as the normal. The results produced by sclerosing solutions injected into this area would defy prediction and would undoubtedly produce more or less distortion of all immediately adjacent structures and perhaps sterility in the male and with no assurance that the hernia would be cured or even affected.

While there would appear to be no place at all for the injection treatment, it is possible that in the case of very aged individuals, or those whose physical state would contraindicate operation, there may occur isolated instances in which an attempt at treatment of this sort might be justified if the patient fully understands the dangers. Any common irritant would undoubtedly serve as well as Pina-Mestre's Solution and at a considerable saving (the price, to physicians, of 60 cc. of the preparation is $20). It is probable though that, whenever surgery is contra-indicated, injection would also be unwise by reason of the possible occurrence of the previously noted complications, any one of which might require immediate operation on a poor-risk patient. For such individuals, a well fitted and frequently adjusted truss may prove satisfactory.

The large or unreducible hernias are the ones that are not always repaired satisfactorily, especially by the inexperienced surgeon, but these could never be safely relieved by injections.

In general, surgical repair by a well trained surgeon offers a satisfactory method for the treatment of hernia with a minimum of local tissue injury and little risk or discomfort.

Hazards of Carbon Tetrachloride in Textile Mill

TO THE EDITOR (J.A.M.A.*): I would greatly appreciate any help you might give me in obtaining information on the prevention of carbon tetrachloride poisoning in a textile mill. M. D., New York.

ANSWER.—So far as is known, the use of carbon tetrachloride in the textile industry is somewhat similar to its use in dry cleaning and as a deterging, degreasing agent in general. Whatever the conditions of use may be, whenever 300 or more parts per million of air are present and respired by human beings, injury is possible or probable. Carbon tetrachloride vapors breathed into the lungs are far more dangerous than liquid carbon tetrachloride ingested. It is, of course, well known that carbon tetrachloride extensively has been applied for the eradication of hookworm and other parasites. The following types of injury from carbon tetrachloride are known:

1. Dermatitis, possibly solely due to the defatting action of carbon tetrachloride.

2. Narcosis. Carbon tetrachloride is similar to chloroform and when concentrations are very high may lead to quick death from anesthetic action.

3. Acute poisoning, characterized by inflammation along the respiratory and intestinal tracts. Bronchitis, pneumonia, pulmonary hemorrhage, ocular hemorrhage, gastro-enteritis and intestinal hemorrhage are established features.

4. Delayed poisoning, probably associated with fatty degeneration of the liver; the formation or at least the presence of guanidine.

5. Chronic poisoning. A chronic state is poorly defined and if encountered possibly represents only the sequelae of acute damage.

The typical case as encountered in industry presents, in terms of increasing severity, some or all of the following: vomiting, nausea, abdominal pain, fulness in the abdomen, sense of masses in the abdomen, respiratory inflammation, headache, diarrhea, blood in the stools, sleepiness, mental sluggishness, jaundice, tenderness over the liver, convulsions, delirium.

Since carbon tetrachloride is absorbable through the skin, preventive measures should embrace protection against this form of entry. Among other preventive measures, the following are suggested:

(a) Encourage a high intake of calcium, as through the drinking of milk.

(b) Avoid alcoholic beverages.

(c) Provide closed systems with appropriate vents wherever possible.

(d) If completely closed symptoms are not possible, positive pressure helmets may be necessary if concentrations are very high.

(e) Exhaust systems should be provided with intakes at the floor level rather than near the ceiling.

(f) Avoid direct skin contact with carbon tetrachloride.

(g) If completely enclosed systems cannot be provided or if through other measures the concentration of carbon tetrachloride vapors cannot be kept below 500 parts per million of air, some less toxic chemical should be substituted for carbon tetrachloride. High boiling point petroleum derivatives such as Stoddard's Solvent, while toxic, are less toxic than carbon tetrachloride.

Some items of literature:

McCord, C. P.: Carbon Tetrachloride—A Non-Technical Discussion of Its Toxicity, *Industrial Medicine* 1:151 (Dec.) 1932.

Lamson, P. D.; Gardner, G. H.; Gustafson, R. K. Maire, E. D.; McLean, A. J., and Wells, H. S.: The Pharmacology and Toxicology of Carbon Tetrachloride, *J. Pharmacol & Exper. Therap.* 22:283 (Nov.) 1923.

Carbon Tetrachloride, Bulletin 93, International Labour Office, Occupation and Health Series.

Report of Investigations 192, 201, 924, Bull. 2499, Department of Interior, U. S. Bureau of Mines, Carbon Tetrachloride Extinguishing of Electric Fires.

Cutler, J. T.: The Accumulation of Guanidine in the Blood Following Acute Liver Injury by Carbon Tetrachloride, Chloroform, Arsenic or Phosphorus, *J. Pharmacol. & Exper. Therap.* 41:337 (March) 1931.

Davis, P. A.: Toxic Substances in the Rubber industry: Carbon Tetrachloride, *Rubber Age* 24:1 part two, 483, 1929.

Havhurst, E. R.: The Use of Carbon Tetrachloride versus Carbon Bisulphide in Industry, *Chem. & Rubber* No. 60, Sept. 3, 1925.

Robbins, B. H.: The Absorption, Distribution and Excretion of Carbon Tetrachloride in Dogs Under Various Conditions. *J. Pharmacol & Exper. Therap.* 37:215 (Oct.) 1929.

Stewart, L. C.: Carbon Tetrachloride in Dry Cleaning, *National Cleaner & Dyer*, April 1931.

To which we would add:

Smythe, Henry Field: Carbon Tetrachloride in Industry, *Industrial Medicine* 4:12 (Jan.) 1935.

*J.A.M.A. for May 18, 1935, p. 1846.

Industry Aids in War On Tuberculosis*

MANY industries maintain full time medical departments and health supervision. Their attitude to tuberculosis has two objectives: prevention and early diagnosis—with a plan of action somewhat as follows:

1. Physical examination of those beginning to work, followed by periodic examinations and occasional exit examinations of those leaving employment—including x-ray films and examination of sputum, when indicated.

2. Hygienic surroundings and environments, including well-ventilated and well-lighted work rooms and offices, with temperature and humidity control.

3. Separate locker rooms for clothes, adjacent shower baths, clean toilets and lavatories.

4. Bulletin boards for posting health information, such as that put out by the Chicago Tuberculosis Institute and National Safety Council.

5. A work week that leaves time for recreation and rest periods. Selective employment for arrested cases of tuberculosis.

6. Observance of state and municipal health regulations. Not all managements observe this entire program, but a majority have adopted a considerable part.

As a part of medical supervision, one Chicago concern, the Crane Company, has demonstrated the value of a convalescent sanitarium, having maintained such an institution near Lake Geneva, Wis., for many years. Not only convalescents, but also those physically below par, are taught how to maintain good health.

* Dr. A. M. Harvey, Chief Physician and Surgeon, Crane Company, Chicago, and a Director of Chicago Tuberculosis Institute, in *Chicago Daily News*, April 26, 1935.

THE BULLETIN

of

The American Association of Industrial Physicians and Surgeons

THE object of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

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Secretary-Treasurer, Chicago

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American Association of Industrial Physicians and Surgeons
June 10 and 11, 1935
HOTEL PENNSYLVANIA
39th & Chestnut Sts., Philadelphia, Pa.

MONDAY 9:00 a.m.—X-ray Laboratory—U. of Pennsylvania.
Monday 10:15 a.m.—Business meeting, election of officers.
Monday 2:00 p.m.—Laboratory of Hygiene, University of Penna.
Monday 8:00 p.m.—Philadelphia College of Physicians & Surgeons, 15 So. 22nd St.
Tuesday 9:00 a.m.—Medical Lecture Room of the Martin Maloney Clinic, University of Pennsylvania, 36th and Spruce Sts.
Tuesday 2:00 p.m.—Hotel Pennsylvania.
Tuesday 8:00 p.m.—Hotel Pennsylvania.

Monday, June 10, 1935, Morning Session:

9:00 a.m.—X-ray, Chest, Dusts—Dr. Eugene P. Pendergrass, Dr. Gabriel Tucker.
10:15 a.m.—Business Meeting.
11:00 a.m.—Round Table:
Physical Examinations — Dr. G. H. Gehrmann.
Chest and Heart—Dr. George Morris Piersol.
Hernia—Dr. Mervynn R. Taylor.
Effects of Previous Employment.
Disabling Deformities.
1:00 p.m.—Lunch.

Monday, June 10, 1935, Afternoon Session:

2:00 p.m.—The Eyes in Industry—Dr. George H. Cross.
2:30 p.m.—Neurosis—Dr. Clarence Patton.
3:00 p.m.—Dermatosis.
3:30 p.m.—Industrial Fatigue Studies—Dr. B. Heisey, Ph.D.
4:00 p.m.—Injuries In and Around Joints—Dr. De Forrest Willard.
4:30 p.m.—Demonstration by the Department of Hygiene of apparatus and methods used in Industrial Hygiene, at the Laboratory.

Monday, June 10, 1935, Evening Session:

8:00 p.m.—Guests of the Industrial Medicine and Health Section of the Philadelphia College of Physicians and Surgeons (at 15 So. 22nd St.). Program arranged by the College Section. Speakers: Dr. Henry H. Kessler, Dr. Albert S. Gray.

Tuesday, June 11, 1935, Morning Session:

9:00 a.m.—At the Medical Lecture Room of the Martin Maloney Clinic, University of Pennsylvania, 36th and Spruce streets. Dr. Alfred Stengel and Staff.
11:00 a.m.—Dr. C. H. Frazier and Staff.
Dr. L. K. Ferguson—Infections of the Hand.
Dr. J. J. Johnson—Fractures of the Upper Third of the Humerus.
Dr. V. W. M. Wright—Physical Therapy for Fractures.
Dr. E. L. Eliason—Function vs. Deformity in Fracture Results.
Dr. Alexander Randall—Trauma of the Kidney and Bladder.

Tuesday, June 11, 1935, Afternoon Session:

2:00 p.m.—The Question of Occupational Disease—Dr. R. R. Sayers, U.S.P.H. Service; Dr. C. O. Sappington, Chicago.
2:30 p.m.—The Present Status of Lead—Dr. W. F. Machle, University of Cincinnati.
3:00 p.m. — Manganese Poisoning Case, Need of Careful Examination—Dr. Fred L. Hartmann.
8:00 p.m.—Annual Dinner — Hotel Pennsylvania.

Proposed Amendments

Constitution:

Article III, Section 1, line 10: after "honorary" insert "and associate." Section 3, line 1: strike out "or associate."

Article V, Section 1, line 2: after "President" insert "President-Elect." Section 1, line 3: after "Secretary-Treasurer" insert "one Vice-President shall be chosen from the membership east of the Mississippi River and one from the membership west of said river."

By-Laws:

Article II, Section 1, line 1: after "active" strike out "and associate." Section 1, line 4: after "honorary" insert "and associate."

Physicians' Equity

PHYSICIANS' Equity Association of America, Inc., in process of formation for 18 months, has opened offices at 745 Fifth Avenue, New York.

Dr. Robert Emmett Walsh, of New York, is President of Physicians' Equity. The Association includes among its aims the elimination of free clinical service for patients who can afford to pay for more exact medical attention, the assurance of reasonable compensation to the physician for every professional service rendered, the introduction of bills in state legislatures to correct abuses now rampant in the practice and regulation of medical, surgical and other conditions affecting public health, the opposing of such legislation as tends to legalize the irregular practitioner, the protection of the public by removing from the profession all unqualified healers, and the creation, on both sides, of a clearer economic situation between patient and doctor. The membership represents no group, clique, religion or political belief; the Association is devoted entirely to the economics of medicine; it obtained the first charter granted to physicians exclusively for a Physicians' Credit Union, a cooperative bank under state supervision, for the exclusive use of doctors, to deposit in and borrow from.

Other officers of the Association are Dr. Edward R. Cunniffe, First Vice-President; Dr. Judson C. Fisher, Second Vice-President; Dr. Seymour Fiske, Secretary; Dr. William M. Cooper, Treasurer; and Edward J. Kelly, Executive Secretary.

Dr. Fiske, Secretary, is quoted:

"Physicians' Equity, working with county medical societies is endeavoring to maintain direct connection with Albany, so that we may not see horrors done in this state in the name of health insurance and necessary amendment of the workmen's compensation laws, which would burden the taxpayer with huge sums for bureaucratic emolument and make physicians the chattelmen of ignorant, inefficient and corrupt local administrative boards. Many of the abuses connected with medical service have arisen in the department of workmen's compensation. These malpractices, reacting equally against physicians and patients, have grown out of suppression of the free choice of physicians and investment of the insurance carriers and employers with control over treatment. Insurance companies and employers frequently, in the past, have been sending injured workmen to hospital clinics for treatment, and hence aiding the hospital racket by substitution of a cheap and inferior type of medical service in the handling of these cases. Vicious discrimination likewise has been practiced by insurance carriers trying to save money for themselves and the employer, against physicians prescribing more expensive medicines than those used in the clinics or refusing to make use of inferior products put out and widely advertised by some of the drug companies. Contemplated amendment of the workmen's compensation laws is aimed at correction of such evils, which have been greatly fostered by competition from the hospitals in a field in which clinics have no proper business."

Occupational Diseases

New York Amendment

HERETOFORE, there has been no occupational disease act in New York State, but the Workmen's Compensation Act allowed compensation for disabilities sustained or death incurred by an employee from the occupational diseases numbered 1 to 27, inclusive, in its schedule.

By the "McCaffrey Bill" Subdivision 2 of Section 3 of the Workmen's Compensation Act is amended by adding at the end of the subdivision, "in Columns one and two," a new subdivision, No. 28, which as to Column one, reads:

"28. Any and all occupational diseases"

and as to Column two reads:

"28. Any and all employments enumerated in subdivision one of section three of this chapter"

and as to both columns says:

"Nothing in group twenty-eight of this subdivision shall be construed to apply to any case of occupational disease in which the last injurious exposure to the hazards of the disease occurred prior to September first, nineteen hundred thirty-five."

The new amendment was approved by the Governor on March 26, 1935, becoming Chapter 254 of the Laws of 1935, and going into effect September 1, 1935.

The place of the new No. 28 in the schedule is shown on p. 279.

Description of Disease	Description of Process
1. Anthrax	1. Handling of wools, hair bristles, hides, or skins
2. Lead poisoning or its sequelae	2. Any process involving the use of or direct contact with lead or its preparations or compounds
3. Zinc poisoning or its sequelae	3. Any process involving the use of or direct contact with zinc or its preparations or compounds
4. Mercury poisoning or its sequelae	4. Any process involving the use of or direct contact with mercury or its preparations or compounds
5. Phosphorus poisoning or its sequelae	5. Any process involving the use of or direct contact with phosphorus or its preparations or compounds
6. Arsenic poisoning or its sequelae	6. Any process involving use of or direct contact with arsenic or its preparations or compounds
7. Poisoning by wood alcohol	7. Any process involving the use of wood alcohol or any preparation containing wood alcohol
8. Poisoning by benzol or nitro-, hydro-, hydroxy,- and amido-derivatives of benzene (dinitrobenzol, anilin and others), or its sequelae	8. Any process involving the use or direct contact with benzol or nitro-, hydro-, hydroxy-, and amido-derivatives of benzene or its preparations or compounds
9. Poisoning by carbon bisulphide or its sequelae or any sulphide	9. Any process involving the use or direct contact with carbon bisulphide or its preparations or compounds, or any sulphide
10. Poisoning by nitrous fumes or its sequelae	10. Any process in which nitrous fumes are evolved
11. Poisoning by nickel carbonyl or its sequelae	11. Any process in which nickel carbonyl in evolved
12. Dope poisoning, poisoning by tetrachlormethane or any substance used as or in conjunction with a solvent for acetate of cellulose or nitrocellulose or its sequelae	12. Any process involving the use or direct contact with any substance used as or in conjunction with a solvent for acetate or cellulose or nitrocellulose
13. Poisoning by formaldehyde and its preparations	13. Any process involving the use or direct contact with formaldehyde and its preparations
14. Chrome ulceration or its sequelae or chrome poisoning	14. Any process involving the use or direct contact with chromic acid or by-chromic acid or by-chromate of ammonium, potassium or sodium, and other preparations
15. Epitheliomatous cancer or ulceration of the skin or of the corneal surface of the eye, due to	15. Handling or use of tar, pitch, bitumen, mineral oil, or paraffin, or any compound, product, or

tar, pitch, bitumen, mineral oil, or paraffin, or any compound, product, or residue of any of these substances	residue of any of these substances
16. Glanders	16. Care or handling of any equine animal or the carcass of any such animal
17. Compressed air illness	17. Any process carried on in compressed air
18. Miners' disease, including only cellulitis, bursitis, ankylostomiasis, tenosynovitis and nystagmus	18. Any process in mining
19. Cataract in glass workers	19. Processes in the manufacture of glass involving exposure to the glare of the molten metal
20. Radium poisoning or disability due to radioactive properties of substances, or to Roentgen rays (x-rays)	20. Any process in the use of or direct contact with radium or radioactive substance, or the use or direct exposure to Roentgen rays (x-rays)
21. Methyl chloride poisoning	21. Any process in the use of or direct contact with methyl chloride or its preparations or compounds
22. Carbon monoxide poisoning	22. Any process in direct exposure to carbon monoxide in buildings, sheds, or enclosed places
23. Poisoning by sulphuric, hydrochloric or hydrofluoric acid	23. Any process involving the use of or direct contact with sulphuric, hydrochloric or hydrofluoric acid or their fumes
24. Respiratory, gastrointestinal, or physiological nerve and eye disorders due to contact with petroleum products and their fumes	24. Any process involving the use of or direct contact with petroleum or petroleum products and their fumes
25. Disability arising from blisters or abrasions	25. Any process involving continuous friction, rubbing or vibration causing blisters or abrasions
26. Disability arising from bursitis or synovitis	26. Any process involving continuous rubbing pressure, or vibration of the parts affected
27. Dermatitis (venenata)	27. Any process involving the use of or direct contact with acids, alkalies, or oils capable of causing dermatitis (venenata)
28. Any and all occupational diseases	**28. Any and all employments enumerated in subdivision one of section three of this chapter.**

Criticism In Ohio

UNDER date December 31, 1934, the Governor's Investigating Committee of Workmen's Compensation Law in Ohio submitted a comprehensive report, with findings both as to past operations and recommendations for the future. Its findings, as the result of its investigations, are of particular significance in view of the fact that four of the five members of the committee represent organizations strongly favoring monopolistic state fund insurance of workmen's compensation. The following are summaries of the principal points in such findings:*

The state has been seriously delinquent in providing funds necessary to a qualified and adequate administrative personnel, and is itself delinquent in payment of premium dues.

A sound actuarial status or insurance factor has not been fully maintained.

Because of political influence, lack of constructive and intelligent development and businesslike methods, and in some instances dishonest personnel, the administration of law has not been efficiently managed and directed.

Certain of the methods and procedures in the department are loose, irregular and unsuitable.

Because of inadequate and, in some instances, inefficient staff, investigation of compensation cases has frequently been inadequate and inaccurate, resulting in delay and unnecessary cost.

Medical examinations and investigations have frequently been inefficient and unsatisfactory causing delay, excessive cost and meriting criticism of both claimants and employers.

There has been no satisfactory enforcement of the penalty laws against recalcitrant and dishonest employers.

Millions of dollars which should have been contributed to the insurance fund have been lost because of inadequate and incompetent administrative staffs.

Actuarial conditions, disclosed, by a thorough survey, are such as to necessitate important changes.

Pay of practically all of the more important employees in the division is inadequate to secure the essential type of personnel.

The administrative budget has been inadequate from the beginning and in recent years have been wholly inadequate.

Problems of the commission have been greatly magnified and the conduct of the insurance fund made more unsatisfactory by the depression.

Bulletin, Association of Casualty and Surety Executives, April, 1935.

ATTORNEYS' TEXT BOOK OF MEDICINE

by

ROSCOE N. GRAY, M.D.

Surgical Director

Aetna Life Insurance Company

Doctor Gray's work brings him into daily contact with hundreds of physicians and surgeons. He is the focal point for a nation-wide medical experience—abreast of new developments in many specialties. The enormous amount of scientific data gathered from research in this wide experience is the basis for his useful new book, the *Attorneys' Textbook of Medicine*. It deals with the field of medicine in which compensation and liability claims most frequently arise; is of utmost practical value to Doctors and Lawyers; is so written that Lawyers may understand Doctors, while, at the same time it is of utmost *practical service* to Doctors in diagnosis and treatment. The text is supported throughout by recognized authorities whose works are cited. It presents medicine through the eyes of the Insurance Carrier, a most important viewpoint, both for the protection of the patient and the protection of society. It aids the Doctor to qualify in the service of insurance carriers on compensation and liability claims.

The usual medical text is of little value in meeting the modern medicolegal problems discussed by Doctor Gray, Silicosis, Buerger's Disease, Chromium Poisoning, the comparative values of permanent disabilities, etc., etc. A condensed table of contents follows:

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Industrial Medicine

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Chicago, Ill.

The Industrial Doctor

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Silicosis

West Virginia Silicosis Act

EFFECTIVE in March, 1935, providing for compensation for disability, disablement or death resulting from silicosis, and defining silicosis.

THAT chapter twenty-three of the code of West Virginia, one thousand nine hundred thirty-one, be amended by the addition of a new article thereto, designated as article six, consisting of sections one to eighteen, inclusive, to read as follows:

ARTICLE VI.: Section 1. The provisions of this article shall be administered by the state compensation commissioner, and the provisions of article one of this chapter are applicable hereto. All charges and expenses peculiar to the administration of this article shall in the proportionate amount be chargeable to and paid out of the workmen's compensation silicosis fund.

Sec. 2. (a) In order that compensation for the disease of silicosis as herein defined might be paid to all persons employed within this state in interstate or intrastate work, as defined by section ten, article two of this chapter, and in the service of those employers legally doing or authorized to do business in this state and who elect to qualify under and subject themselves to the provisions of this article, the commissioner shall make the necessary separate classifications of the various industries for those employers who so elect, and the commissioner shall make such classifications and fix the rate of premiums in the manner provided by section four of article two of this chapter. Those employers who do not elect to come within the provisions of this article shall not be subject to the provisions of article two of this chapter except as otherwise specifically provided in this article. The assessments and premiums paid by such employers so electing shall be kept by the commissioner in a separate fund to be known and designated as "workmen's compensation silicosis fund."

(b) For the purpose of creating the workmen's compensation silicosis fund, each employer electing to become subject thereto under the provisions of this article shall make his election and pay the premiums in the manner provided by section five of article two of this chapter.

(c) Every employer electing to come under the provisions of this article shall give the information, and make the necessary reports, to the commissioner as provided by sections two and three of article two of this chapter.

(d) Except as otherwise herein specifically provided, all the provisions of this chapter relating to premiums and assessments paid into, and disbursements for benefits, compensation, medical and hospital treatment, funeral expenses, and other charges from, the fund designated as "workmen's compensation fund," and the limitations of the amounts to be thereby expended, shall likewise apply to the fund designated as "workmen's compensation silicosis fund"; and the term "workmen's compensation fund" as used in this chapter, whenever applicable, shall be construed to mean and include the term "workmen's compensation silicosis fund."

Sec. 3. Each employer electing to pay the premiums provided by this article into the workmen's compensation silicosis fund, or electing to make direct payments of compensation as provided by section nine of article two of this chapter, shall post, and keep posted, in conspicuous places about his place or places of business, typewritten or printed notices in the form prescribed by the commissioner, stating the fact that such employer has made such election, and the same when so posted shall constitute sufficient notice to all his employees, and to the parents of any minor employees, of the fact that the emp'oyer has made such election; and any employer who makes such election shall not thereafter be liable to respond in damages at common law or by statute for the disease or death of any employee because of silicosis during the period in which such employer shall not be in default in the payment of such premiums and shall have complied fully with all other provisions of this article.

Sec. 4. (a) The commissioner shall establish a fund, to be known as "workmen's compensation silicosis fund," from the premiums and other funds paid thereto by employers who have elected to pay and have paid the premiums applicable to such employers under the provisions of this article relating to silicosis, for the benefit of employees of employers who have paid the premiums applicable to such employers, and have otherwise complied fully with the provisions of section five, article two of this chapter, and for the benefit of the dependents of such employees, and for the payment of the administration expenses of this article, and shall adopt rules and regulations in respect to the collection, maintenance and disbursement of such funds not in conflict with the provisions of this chapter.

(b) Ten per cent of all that shall hereafter be paid into the workmen's compensation silicosis fund shall be set aside for the creation of a sufficient surplus fund, within the discretion of the commissioner, not exceeding one hundred thousand dollars, after which time the sum of five per cent of all the money paid into such fund shall be credited to such surplus fund until such time as in the judgment of the commissioner such surplus fund shall be sufficiently large to cover the catastrophe hazard and all losses not otherwise specifically provided for in this article.

Employers electing as provided by this chapter to individually and di-

rectly compensate their employees having silicosis, or their dependents, shall do so in the manner prescribed by the compensation commissioner, and shall make all reports and execute all blanks, forms and papers as directed by said commissioner and as herein provided in this chapter.

(d) The custody, investment and disbursement of the workmen's compensation silicosis fund shall be in the manner and form prescribed by section two, article three of this chapter, and any and all amendments thereto.

Sec. 5. The commissioner shall disburse the workmen's compensation silciosis fund to the employees of such employers as are not delinquent in the payment of premiums for the last month in which said employees have been exposed to silicon dioxide dust in harmful quantities and who have otherwise complied fully with the provisions of this article, and which employees shall have contracted silicosis in this state in the course of and resulting from their employment, or to the dependents, if any, of such employees, in case death has ensued, according to the provisions hereinafter made.

Where an employee suffers from the disease of silicosis as hereinafter defined, or dies as the result of such disease, and the disease is due to the nature of an occupation or process in which he was employed at any time within one year previous to such disease, and claim therefor has been made within one year after the last exposure of said employee to silicon dioxide dust in harmful quantities, the employee, or in case of death his dependents, shall be entitled to compensation for silicosis as provided herein: Provided, however, That compensation shall not be payable for the disease of silicosis, or death resulting therefrom, unless the employee has been exposed to the inhalation of silicon dioxide dust in harmful quantities over a period of not less than two years in the same employment in this state.

For the purposes of this article, silicosis is defined as an insidious fibrotic disease of the lung or lungs due to prolonged inhalation and accumulation sustained in the course of and resulting from his employment, of minute particles of dust containing silicon dioxide (SiO_2) over such a period of time and in such amounts as result in the substitution of fibrous tissue for normal lung tissues; and the term "silicosis" as used herein shall also include silicosis accompanied by tuberculosis of the lungs evidenced by the presence of tubercle bacillus in the sputum.

Sec. 6. Notwithstanding anything hereinbefore or hereinafter contained, no employee or dependent of any employee shall be entitled to receive any sum from the workmen's compensation silicosis fund, or to direct compensation from any employer making the election and receiving the permission mentioned in section nine, article two of this chapter, or otherwise under the provisions of this chapter, on account of contracting the disease of silicosis caused by willful misconduct, willful self-exposure as defined herein, disobedience to such rules and regulations as may be adopted by the employer and approved by the commissioner, and which rules and regulations have been and are kept posted in conspicuous places in and about the premises, or the failure of such employee to use or make use of any protective or safety appliance or appliances prescribed by the commissioner and furnished by the employer for the use of or applicable to such employee, nor shall any employee or dependent thereof maintain any action for damages on account of disability arising from the disease of silicosis contracted through willful self-exposure as defined herein. For the purposes of this article and to prevent employees from contracting silicosis, the commissioner may require all employers to adopt rules which have been approved by him for the protection and safety of his employees, and keep the same posted in conspicuous places in and about the premises; and the commissioner shall require employers to install, use or adopt such protective or safety appliance or appliances as in the commissioner's opinion are necessary for the protection of the employees. If silicosis or death therefrom result to any employee from the deliberate intention of his employer to produce silicosis or death therefrom, the employee, the widow, widower, child or dependent of the employee, shall have the privilege to take under this article, and shall also have cause of action against the employer as if this chapter had not been enacted for any excess of damages over the amount received or receivable under this chapter. As used in this section, the term, "deliberate intention," shall mean conscious and willful determination.

As used in this section, the term, "willful self-exposure," causing the contraction of the disease of silicosis, shall include: (1) Failure or omission on the part of an employee to observe such rules and regulations as may be adopted by the employer and approved by the commissioner and which rules and regulations have been and are kept posted in a conspicuous place in and about the premises; (2) failure or omission on the part of an employee truthfully to state to the best of his knowledge in answer to inquiry made by the employer, the place, duration, and nature of previous employment; (3) failure or omission on the part of an employee truthfully to answer to the best of his knowledge in answer to an inquiry made by the employer concerning full information about the previous status of his health, habits, and medical attention that he or his blood relatives may have theretofore received.

Sec. 7. An employee shall, for the purposes hereof, be deemed to have silicosis: (1) In the first stage, when it is found by the commissioner that the earliest detectable specific signs of silicosis are present, whether or not capacity for work is or has been impaired by such silicosis; (2) in the second stage, when it is found by the commissioner that definite and specific physical signs of silicosis are present, and that capacity for work is or has been impaired by that disease; (3) in the third stage, when it is found by the commissioner that the employee has silicosis accompanied by tuberculosis of the lungs evidenced by the presence of tubercle bacillus in the sputum.

Where compensation for silicosis is due an employee under the provisions hereof, such compensation shall be provided in the following schedule: (a) If the employee is suffering from silicosis in the first stage, the employee shall receive the sum of five hundred dollars as compensation in full for said disease that he has sustained as a result of and in the course of his employment, said sum to be payable as a lump sum or in periodic installments in the discretion of the commissioner, and shall be a final payment and operate as a full release by the employee for compensation and for any claim against the employer that the employee may thereafter have for silicosis, and irrespective of whether the employee thereafter continues in the same employment, he shall not have the right to receive any or further compensation or make any claim because of silicosis either to the compensation commissioner or against his employer, anything to the contrary in this chapter notwithstanding; (b) if the employee is suffering from silicosis in the second stage, the employee shall receive the sum of one thousand dollars as compensation in full for said disease that he has sustained as a result of and in the course of his employment, said sum to be payable as a lump sum or in periodic installments in the discretion of the commissioner, and shall be a final payment and operate as a full release by the employee for compensation and for any claim against the employer that the employee may thereafter have for silicosis, and irrespective of whether the employee thereafter continues in the same employment, he shall not have the right to receive any or further compensation or make any claim because of silicosis either to the commissioner or against his employer, anything to the contrary in this chapter notwithstanding; (c) if the employee is suffering from silicosis in the third stage, the compensation shall be paid therefor in the same manner and at the same rate as is provided for permanent disability under the provisions of subdivisions (c), (f) and (h) of section six, article four, of this chapter; (d) if the employee dies from silicosis within one year from the date of the last exposure of the employee to silicon dioxide dust in harmful quantities, the benefits shall be in the amounts and to the persons provided for in section one, article four of this chapter; as to such benefits sections eleven to fourteen, inclusive, of article four of this chapter shall apply.

Sec. 8. The commissioner shall have power, after due notice to the employer, and whenever in his opinion it shall be necessary, to order a claimant to appear for examination before the medical board hereinafter provided. Claimant shall be entitled to reasonable traveling and other expenses necessarily incurred by him in obeying such order, which shall be paid out of the workmen's compensation silicosis fund within the amount allowed for medical, surgical and hospital treatment.

Sec. 9. (a) To entitle any employee to compensation for silicosis under the provisions hereof, the application therefor must be made on a form or forms prescribed by the commissioner and filed in the office of the commissioner within one year from and after the date of the last injurious exposure to silicon dioxide dust, or

in case of death, the application shall be filed as aforesaid by the dependent of such employee within one year from and after the date of the last injurious exposure to silicon dioxide dust.

(b) Nonresident aliens may be officially represented by the consular officers of the country of which such aliens may be citizens or subjects: Provided, That nothing herein contained shall be construed as giving such consular officer the right to make application for compensation in behalf of the nonresident aliens.

Sec. 10. Unless the employer during the continuance of employment shall have actual knowledge that the employee has contracted silicosis, or unless the employee or some one on his behalf or his dependents shall give written notice of a claim that such employee has contracted silicosis, within a period of one year after the date when said employee shall have ceased to be subject to injurious exposure to silicon dioxide dust in employment with said employer, no compensation shall be allowed and paid on account of death or disability of such employee by reason of silicosis.

Sec. 11. On the hearing of a claim for compensation for silicosis, the commissioner shall hear, determine and file findings covering, but not limited to, the following non-medical questions:

(a) Whether the employee was in fact, within one year prior to the filing of his claim, in the employ of the employer, and, if so, the duration of such employment and whether or not such employment was subject to the provisions hereof;

(b) The occupation or occupations, process or processes in which the employee was engaged during such employment, and the approximate periods of work in each such occupation or process;

(c) The employments, previous and subsequent to the employment out of which the claim arose, the duration thereof, and the exposure therein to the hazard of silicon dioxide dust;

(d) Whether such employee contracted said disease through willful self-exposure;

(e) The average weekly wages of the employee at the time of his last injurious exposure to silicon dioxide dust in the employment of the employer;

(f) The date of the last injurious exposure to silicon dioxide dust in the employment with the employer, and if the employee is no longer in the service of the employer, the date upon which said employee ceased so to work, and, if the employee has died, the date and place of such death and the place of interment of the body.

Sec. 12. There shall be a medical board, known as the "silicosis medical board", which shall consist of three licensed physicians, who shall be appointed by the commissioner. No person shall be appointed as a member of said board, or as a consultant thereto, who has not by special study or experience, or both, acquired special knowledge of pulmonary diseases. All members of the silicosis medical board shall be physicians of good professional standing, admitted to practice medicine and surgery in this state, and two of said physicians shall be roentgenologists. One of the board shall be designated annually as chairman by the commissioner. The term of office of each member of such board shall be six years, except that the terms of the members first appointed shall be two, four and six years, respectively. The function of such board shall be to determine all medical questions in cases of compensation for silicosis under the direction and supervision of the commissioner. The commissioner, from time to time, shall fix the per diem salary, computed on the basis of actual time devoted to the discharge of their duties, to be paid each member of such board, and they shall also be entitled to reasonable and necessary traveling and other expenses incurred while actually engaged in the performance of their duties.

Sec. 13. The silicosis medical board, upon reference to it by the commissioner of a case of silicosis, shall notify the employee, or in case he is dead, the claimant, and the employer, to appear before such board at a time and place stated in the notice. If the employee be living, he shall appear before the board at the time and place specified and submit to such examinations, including clinical and x-ray examinations, as the board may require. If a physician licensed to practice medicine in the state shall make affidavit that the employee is physically unable to appear at the time and place designated by the board, such board shall, on notice to the proper parties, change the place and time of examination to such other place and time as may reasonably facilitate the hearing or examination of the employee. The employee, or in case he is dead, the claimant, and the employer shall also produce as evidence to the board all reports of medical and x-ray examinations which may be in their respective possession or control, showing the past or present condition of the employee. If the employee be dead, the notice of the board shall further require that the claimant produce necessary consents and permits so that an autopsy may be performed, if the board shall so direct. When in the opinion of the board an autopsy is deemed necessary to accurately and scientifically ascertain and determine the cause of death, such autopsy examination shall be ordered by the board, which shall designate a duly licensed physician, a pathologist, or such other specialists as may be deemed necessary by the board, to make such examination and tests to determine the cause of death and certify his or their written findings, in triplicate, to said board, and which findings shall be public records. In the event that a claimant for compensation for such death refuses to consent and permit such autopsy to be made, all rights for compensation shall thereupon be forfeited.

The employee, or if he be dead, the claimant, and the employer, shall be entitled to be present at all examinations conducted by the board, and to be represented by attorneys and physicians.

Sec. 14. The silicosis medical board, as soon as practicable after it has completed its investigation, shall make its written report, in triplicate, to the commissioner, of its findings and conclusions on every medical question in controversy, and the commissioner shall send one copy thereof to the employee or claimant and one copy to the employer, and the said board shall also return to and file with the commissioner all the evidence, as well as all statements under oath, if any, of the persons who appeared before it on behalf of the employee or claimant, or employer, and also all medical reports and x-ray examinations produced by or on behalf of the employee or claimant, or employer.

The findings and conclusions of the said board shall set forth, among other things, the following:

(a) Whether or not the claimant or the deceased employee has contracted silicosis, and, if so, the stage thereof;

(b) If the claimant or the deceased employee has contracted such disease, whether or not the exposure in the employment, with said employer, was sufficient to have caused silicosis or to have injuriously aggravated an existing silicosis;

(c) What, if any, physician appeared before the board on behalf of the claimant, and what, if any, x-rays were produced by or on behalf of the claimant, and what, if any, physician appeared before the board on behalf of the employer, and what, if any, x-rays were produced by or on behalf of the employer.

If either party object to the whole or any part of such findings and conclusions of the board, he shall file with the commissioner, within ten days of the mailing of said copy to him, unless for good cause shown the commissioner extends said time, his objections, in writing, thereto, specifying the particular statements of the board's findings and conclusions to which he objects. After the time has expired for the filing of objections to the findings and conclusions of the board, the commissioner shall proceed to act as provided in this chapter. If after the time has expired for the filing of objections to the findings and conclusions of the board no objections have been filed, the report of a majority of the board of its findings and conclusions on any medical question shall be taken to be plenary and conclusive evidence of the findings and conclusions therein stated. If objection has been filed to the findings and conclusions of the board, notice thereof shall be given to the board, and the members thereof joining in such findings and conclusions shall appear at the time fixed by the commissioner for the hearing to submit to examination and cross examination in respect to such findings and conclusions. At such hearing evidence to controvert the findings and conclusions of the board shall be limited to examination and cross examination of the members of the board appearing, and in addition thereto only the testimony of such physician or physicians as may have appeared before the board on behalf of the claimant or the employer, or each, and participated in all of the examinations conducted by such board: Provided, That if such physician shall have died or is physically unable to attend, after appearing before said board, the party whom he represented may select any other duly licensed physician of West Virginia and may introduce his testimony in addition to that of one who has so died or is so physically unable to attend.

Sec. 15. The provisions hereof shall

not apply to cases of silicosis in which the last injurious exposure to silicon dioxide dust in harmful quantities occurred before the provisions hereof shall have taken effect; Provided, That any employer hereunder may elect to provide and pay compensation hereunder for silicosis in which the last injurious exposure to the hazards of such disease occurred before the provisions hereof shall have taken effect, by filing notice of such election with the commissioner and posting copies of said notice in conspicuous places on his premises, and every employee who is employed at the time of posting such notice shall be deemed to have accepted all the provisions hereof and shall be bound thereby unless within thirty days after the filing and posting of such notice such employee shall file a notice to the contrary with the commissioner, whose duty it shall be to immediately notify the employer: Provided further, That any employer and any former employee thereof, prior to the date the provisions hereof take effect, when such former employee claims to have contracted silicosis, may by an agreement in writing elect to accept the provisions hereof, whereupon such former employee shall file his application with the commissioner, and the commissioner is hereby authorized to act in such cases, in which event all charges for administration and other expenses shall be charged to the particular employer, and if the commissioner finds that compensation should be paid, he shall determine the total amount and all administration charges thereof and assess same against the particular employer, who shall at once make payment of the full amount thereof into the workmen's compensation silicosis fund, and such amount so awarded shall be disbursed by the commissioner as in any other case arising under the provisions hereof.

Sec. 16. Compensation shall be paid only to or for the use of such employees, or their dependents, as herein provided, and shall be exempt from all claims of creditors and from any attachment, execution or assignment. Payments shall be made in such periodical installments as may seem best to the commissioner in each case.

Sec. 17. Any person who shall knowingly and with fraudulent intent secure or attempt to secure larger compensation, or compensation for a longer term that he is entitled to, from the workmen's compensation silicosis fund, or knowingly and with like intent secure or attempt to secure compensation from such fund when he is not entitled thereto, or shall knowingly and with like intent aid or abet anyone in the commission of the offenses herein set forth, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not exceeding five hundred dollars or imprisoned not exceeding twelve months, or both, in the discretion of the court, and if the person so convicted is receiving compensation from such fund, he shall from and after such conviction cease to receive such compensation.

Sec. 18. The provisions of section one, article five of this chapter, providing for the finality of the commissioner's rulings and the review by the supreme court of appeals, are applicable to the provisions of this article.

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All acts and parts of acts in conflict with this act, or any part thereof, are hereby repealed. The various provisions of this act shall be construed as separable and several, and should any of the provisions, sentences, clauses or parts thereof be construed or held unconstitutional, or for any other reason invalid, the remaining provisions of this act shall not be thereby affected.

The Law Creating the Massachusetts Divison of Occupational Hygiene

AN ACT establishing a Division of Occupational Hygiene in the Department of Labor and Industries and defining its Powers and Duties.

SECTION 1. Section three of chapter twenty-three of the General Laws as appearing in the Tercentenary Edition, is hereby amended by inserting after the word "life" in the seventh line the following: —, a division of occupational hygiene, — so as to read as follows—Section 3. The commissioner shall be the executive and administrative head of the department. He shall have charge of the administration and enforcement of all laws, rules and regulations which it is the duty of the department to administer and enforce, and shall direct all inspections and investigations except as otherwise provided. He shall organize in the department a division of standards, a division on the necessaries of life, a division of occupational hygiene, and such other divisions as he may from time to time determine, and many assign the officers and employees of the department thereto. He shall prepare for

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the consideration of the assistant commissioner and the associate commissioners rules and regulations for the conduct of the department and all other rules and regulations which the department is authorized by law to make, and they shall, except as otherwise provided, take effect when approved by the associate commissioners and the assistant commissioner, or upon such date as they determine. The commissioner may designate the assistant commissioner or an associate commissioner to discharge the duties of the commissioner during his absence or disability.

SECTION 2. Section four of said chapter twenty-three as so appearing is hereby amended by striking out, in the third line, the word "six" and inserting in place thereof the word: — seven, — so as to read as follows: — SECTION 4. The commissioner, assistant commissioner and associate commissioners may, with the approval of the governor and council, appoint, and fix the salaries of, not more than seven directors, and may, with like approval, remove them. One of them, to be known as the director of standards, shall have charge of the division of standards, and one of them, to be known as the director of the division on the necessaries of life, shall have charge of said division, and each of the others shall be assigned to take charge of a division. The commissioner may employ, for periods not exceeding ninety days, such experts as may be necessary to assist the department in the performance of any duty imposed upon it by law, and such employment shall be exempt from chapter thirty-one. Except as otherwise provided in section nine B, the commissioner may employ and remove such inspectors, investigators, clerks and other assistants as the work of the department may require. Such number of inspectors as the commissioner may deem necessary shall be men who, before their employment as such, have had at least three years' experience as building construction workmen. The commissioner may require that certain inspectors in the department, not more than seven in number, shall be persons qualified by training and experience in matters relating to health and sanitation.

SECTION 3. Said chapter twenty-three is hereby further amended by inserting after section eleven the following new section and heading:—

DIVISION OF OCCUPATIONAL HYGIENE

SECTION 11A. In addition to such staff and facilities as may be necessary in the efficient performance of its duties, there shall be employed in the division of occupational hygiene persons having special knowledge of the causes and prevention of occupational diseases. It shall be the duty of the division to investigate conditions of occupation with reference to hazards to health and to determine the degree of such hazards, to investigate and evaluate methods for the control of such hazards, to assist in the preparation of rules and regulations for the preventing of occupational accidents and diseases, and, in co-operation with the department of public health or otherwise, to promote occupational health and safety education.

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